



3 1761 04291 4184



Digitized by the Internet Archive
in 2007 with funding from
Microsoft Corporation

**THE PSYCHOLOGY
OF REASONING**

P642ps

THE PSYCHOLOGY OF REASONING

BY

W. B. PILLSBURY, PH. D.

JUNIOR PROFESSOR OF PHILOSOPHY, DIRECTOR OF THE PSY-
CHOLOGICAL LABORATORY, UNIVERSITY OF MICHIGAN



109800
8/5/11

D. APPLETON AND COMPANY
NEW YORK AND LONDON: 1910



COPYRIGHT, 1910, BY
D. APPLETON AND COMPANY

Published May, 1910

“All men are mortal,
Socrates is a man.
Therefore, Socrates is mortal.”

PREFACE

This little volume is based upon eight lectures given during my tenure of the Non-resident Lectureship in Psychology at Columbia University in January and February, 1909. The material has been somewhat rearranged and divided into chapters along more natural lines than was possible in the lectures.

My purpose is to give a brief statement of the place of the logical processes, particularly judgment and inference, in the concrete individual consciousness. Confining my discussion to the facts of the individual consciousness has compelled me to omit in large measure a consideration of the social aspects of reasoning and of the results of the outcome of reasoning in action. This omission has not been due to any failure to appreciate the importance of these two sides of the reasoning process. Rather, Professor Baldwin and Professor Dewey have left little to be said on these topics. For my own immediate purpose, also, society and action are but two of the sources from which are drawn the materials of reasoning, and are but two of the influences that serve to affect the course of reasoning. My problem has been to determine the ways in which reasoning has grown out of the simpler mental operations, and to discuss the uses that have been made of the materials in reasoning, without reference to the sources from which the materials have been drawn.

PREFACE

Needless to say, I have neglected to discuss or even to mention many phases of the reasoning process that are important. I should have been very glad to find space for a psychological interpretation of fallacies and even for the more important forms of the syllogism, but space and the limitations imposed by a semi-popular audience made that impossible. I have also made no attempt to review the literature of either logic or psychology exhaustively even on the topics discussed. Even where my conclusions have grown out of the discussions of others, I have not always indicated the fact. I had space to do no more than summarize my own results and could cite the related work of others in but few instances.

I desire, however, to express my gratitude in general to the many writers from whom I have drawn inspiration. Perhaps I owe most to Bradley and Bosanquet, although I very much doubt if either would be willing to recognize me as a disciple. Of the more recent writers, Professors Dewey and Baldwin have been most helpful. I have received many suggestions and even more stimulus from my colleagues at the University of Michigan, and from my temporary colleagues at Columbia during the preparation of the manuscript, for which I am glad to acknowledge my indebtedness. Particularly I desire to thank Professor Cattell, whose invitation to give these lectures and to spend a half-year at Columbia at once gave the incentive and the leisure for the preparation of the lectures.

W. B. PILLSBURY.

CONTENTS

CHAPTER	PAGE
I. THE PLACE OF REASONING IN PSYCHOLOGY	1
II. BELIEF	23
III. MEANING AND THE CONCEPT	60
IV. JUDGMENT	99
V. JUDGMENT AND LANGUAGE	137
VI. INFERENCE	172
VII. PROOF—THE SYLLOGISM	200
VIII. THE NATURE OF INDUCTIVE PROOF	236
IX. DEGREES OF TRUTH. MODALITY AND PROBABILITY	255
X. CONCLUSION	276

THE PSYCHOLOGY OF REASONING

CHAPTER I

THE PLACE OF REASONING IN PSYCHOLOGY

As is usual with terms that are used both popularly and scientifically, reasoning has a multitude of meanings and a very large number of implications and relationships. In popular use reasoning is often made to include all actions that are not the outcome of habit and instinct; sometimes it is restricted in its use to the highest mental accomplishments. In the former use, the animal reasons when it applies some earlier acquired response in a new way; in the latter, man is said to reason when he is solving some abstruse problem in mathematics or in the sciences, while he would be but remembering or using some lower capacity when he finds the solution for a puzzle. Where usage is so divergent, one might accept any

THE PSYCHOLOGY OF REASONING

meaning that is desired. The wider of the two in question seems the more satisfactory, and corresponds more closely with psychological usage. For our purposes reasoning shall be considered the application of any knowledge in a new way. Reasoning may be particular, as when one avoids a difficulty in accomplishing some task, or it may be abstract in reaching some conclusion about the ultimate nature of the universe. Each must be included in any theory that pretends to discuss reasoning.

If one turns from the more general relations to the place of reasoning in a technical psychological discussion, one finds that it has, on the one hand, close relations to the memory and imagination processes and, on the other, to the active processes of habit and instinct. In relation to action, reasoning is a muscular product and the ends are at once realized. In the form of reasoning that is closely related to memory and imagination, on the other hand, the results of reasoning are purely subjective. They may be tested later in action but, as they stand, they are purely mental processes, not actions. Each needs separate discussion, each is controlled by different laws, although what distinguishes reasoning from the related processes

THE PLACE OF REASONING

is about the same in each field. While the two uses of the word are different, they are applicable to the same general operation expressed in different ways.

Reasoning, as a purely mental operation, is, like all of the cognitive processes, to be explained by association. It is primarily a process of making use of the acquired experiences, and these are to be explained, so far as their connections and the order of their recall are concerned, in terms of association. Ordinarily, the same materials are used when one thinks abstractly and in connection with a new problem, as when one recalls a familiar experience. Each is represented by a concrete picture, although each may be in terms of words or of some more general ideas. One may remember the face of a friend in clear images, as one may plan an instrument in simple pictures of the instrument, but one may remember in purely verbal terms merely that the friend was present on a certain occasion and also may plan the instrument in words, or in the most vague way may think that the device in question will work. Similarly, if one will but follow through a chain of reasoning, it will be observed that the elements are con-

THE PSYCHOLOGY OF REASONING

nected by the same laws of association that are operative in the simplest recall. Neither the materials nor medium of reasoning, or the laws of connection, then, are distinctive of reasoning as opposed to recall or imagination. What does seem to be characteristic is the way the material is applied and the resulting attitude toward the construction, the attitude of belief or of doubt. If the materials are combined in the old familiar way, they are felt to be familiar, are recognized. They are also ordinarily believed to have real existence. If new combinations of the old material are made, the result is unfamiliar. The result may be regarded as untrue to reality, in which case, one employs imagination; or if it be regarded as a true combination even when new, one calls the result reasoning. These serve as the distinguishing marks of the processes that come through association. What is recognized is said to be remembered; what is not recognized is said to be the result of reasoning or imagination. While reason is like imagination in that both are new combinations or applications of old material, it is like memory in that the results are believed to hold of reality. Reasoning gives a product that is believed but not recog-

THE PLACE OF REASONING

nized; memory a product that is at once believed and recognized; while imagination's product is neither believed nor recognized.

One other fact of reasoning often emphasized, is that reasoning deals with general statements and often with abstract qualities, not merely with the particular and the concrete. This is undoubtedly one of the most striking capacities of the human, if not of all mind, but it is not a quality that is altogether peculiar to reasoning. One very frequently remembers in abstract terms; one remembers general events as well as particulars. This, then, as was noticed above, is not peculiar to reasoning, although without it reasoning and thinking of all kinds would be far less effective than they are. On the purely mental side, truth and newness are the only distinguishing characteristics of reasoning, and these only from the fact that it is in reasoning alone that they occur together.

As a form of action, reasoning is to be distinguished from habit and instinct. As opposed to both, it is characterized by the newness of the act or the newness of the application of the act. Habit and instinct are found in the lowest forms of animals and from the earliest stage in the development of the child. Reasoning makes its

THE PSYCHOLOGY OF REASONING

appearance only in the higher animals and relatively late in the development of the human being. Habit is dependent merely upon changes in the organism that are induced by any action which make that action repeat itself whenever similar occasions arise. It is to be related to changes in the connection of the elements that unite nerve cells, originally not united. Instinct is an expression of changes in the organism as a result of selection; habit of changes in the individual as a result of some movement hit upon by chance and found to give desirable results. In reasoning the old act is used when some new occasion arises for which no habit has been developed. The movement is, in this case, identical in character with the movement that is applied in the habitual way. The only distinguishing characteristics are that the connections of the act are new, and that it is directed immediately to the end that it is to serve. It does not come as the result of chance trial, and it must be adequate to the end. Habit is seen in the act of a soldier who fires at the word of command, reason in the act of a general who sees in a given engagement a similarity to an historical battle and makes use of a disposition similar to the one that won a famous vic-

THE PLACE OF REASONING

tory. Reasoning would be exhibited, too, when a soldier made use of his firearm to provide a splint for a wounded companion in a way that he had not been previously drilled to use it. Here a familiar stimulus or object elicits a new response.

These two applications of reasoning are at first sight rather widely divergent. If closely analyzed, however, they are seen to be very much alike. Each is marked by the new application of an old experience; each, too, results in an adequate solution of the problem presented, or in a solution believed to be adequate should occasion arise for its practical application. Each, too, is distinguished from other ideas or other actions only by these two features, or by a combination of these two features. Random ideas, like random actions, are new but since not true or not adequate at the moment are not said to be rational. On the other hand, recalled ideas and habits are usually adequate, but are not new, and hence are not classed as reasoning. The only fundamental distinction between the two forms is that one is an idea, the other a movement or series of movements. Even this distinction ceases to be of importance when one considers that the ideas that are designated

THE PSYCHOLOGY OF REASONING

reasoning are usually developed with reference to their ultimate expression in action of some sort. The act is merely delayed. And in action one usually may detect in himself ideas that precede the act. Reasoning in idea is but action postponed, reasoning in action is but an idea expressed.

If reasoning is applied to approximately the same operations in thinking and action, it should be possible to describe the character of the rational process more in detail and more concretely. Reasoning, like all mental operations, can be understood only in its setting. While, for simplicity of explanation, it is necessary to assume that consciousness may be thought of as made up of elements, it does not follow at all that the elements exist in the same way outside of their connections, as in them. Because an animal can be understood only when considered as made up of separate elements, it does not follow that the elements have the same function apart from the whole that they have in it. Mental elements are even more closely dependent upon the whole of which they are the part for their real and true existence. When torn from their setting, they no longer bear sufficient resemblance to their character in the

THE PLACE OF REASONING

setting to be recognized as the same structure. Reasoning in particular must be studied in its place in the whole of mind. As will be seen in the course of the discussion, many of the defects in the earlier treatments and in many of the current treatments of the reasoning operations come from the attempt to understand them apart from the natural context.

To understand any concrete bit of reasoning, one must consider four phases or parts of the process: (1) Every act of reasoning is closely related to the felt need or purpose of the individual at the moment. This is purely subjective in its origin and an expression of much in the earlier history of that individual and in his immediately preceding life. It is connected with the desires, and these go back to early training; with life purpose, however originated; and finally with instinct. The purpose cannot, in its turn, be understood apart from the larger whole of the life of the individual, although the momentary purpose is sufficient to enable one to understand the course of reasoning. (2) The outcome of reasoning is dependent very largely upon the tools that present themselves and upon the other external circumstances of the moment, more particularly upon the way the

THE PSYCHOLOGY OF REASONING

circumstances of the moment are appreciated and interpreted. The interpretation or appreciation of the situation is very closely connected with the purpose. When one is interested in a problem, one sees it in a certain situation. When the purpose changes, the interpretation differs. The purpose, then, is dependent for its accomplishment upon the material setting, but the setting is dependent for its interpretation upon the purpose. (3) When a purpose and situation are given, some solution of the problem usually suggests itself. The solution will depend upon the connections that have been earlier developed. If the solution is in idea alone, the situation will recall old ideas that have been used in more or less similar situations to solve similar problems. If the solution is a movement, the situation will call out accustomed movements that have been learned in other connections and will apply them to the new problem. In either case the outcome will be controlled in some degree by the purpose that is dominant. (4) Finally, each solution must be tested. The test will be the actual success of the movement if the solution is an act; it will be the belief, disbelief, or doubt of the suggested solution if the answer is in idea

THE PLACE OF REASONING

alone. These four stages or phases may be distinguished in every bit of reasoning. Often the line of demarkation between two succeeding elements is difficult to determine. Sometimes one of the elements may lie in the background and not be at all obvious, but a little observation will serve to bring it out. Thus the test and the solution may be part of the same process. One may be not at all impressed by the fact that the movement is adequate, one may not consciously raise the question of belief, but the adequateness and the belief are taken for granted. In many cases proper appreciation of the situation gives the solution so immediately that belief in its adequacy need not be expressed in words. This is the usual result where the situation and solution have been frequently connected. The controlling purpose often seems to be no part of the reasoning process, and one is in fact seldom aware of it. But failure to take the influence of the dominant purpose of the moment into consideration is responsible for many misconceptions of the process. Each of the four stages must be considered or the knowledge of the whole is certain to be defective.

These four factors of reasoning have many psychological and many logical relations. In

THE PSYCHOLOGY OF REASONING

fact, they are practically identical with psychological processes, very familiar under other names. What we have called the purpose is recognized by practically every writer and made to play a prominent part in the explanation of all of the spontaneous mental operations. It is represented in the systems of Herbart, Stout, and Wundt, by apperception. It appears in the writings of many as attention or as the controlling factor in attention, and receives the name of "attitude" or "cortical set" in the writings of several very recent workers. Whatever it may be called, it is the determining factor in practically all of the concrete mental operations. It gives form to the different percepts, gives direction to association, decides between the different memories that are competing for recall and it rules action. Reasoning then is not alone in its subordination to the wider purpose of the moment. The character of each of these familiar operations changes as the purpose varies. In them too the purpose does not stand alone but is an outgrowth of very many elements in the experience and inheritance of the individual.

The second part of the operation, the appreciation of the situation is approximately identi-

THE PLACE OF REASONING

cal with attention and perception. To be affected by the situation we must attend to it; to make use of the materials offered we must interpret them, and interpretation is practically identical with perception. As we shall have occasion to indicate later, it is more difficult to distinguish between appreciation and perception than it is to discover points of similarity between them. The third part of the process in order of development, the overcoming of the appreciated difficulty or making any needed improvement in the appreciated situation, is in its character essentially one with association or, if the improvement be actual not thought, with habit. Like controlled association, or controlled response in any connection or in any operation, it is the outcome of earlier association with the appreciated situation checked and directed by the dominant purpose. While this is the really effective step in reasoning, little need be said about it since it differs from other forms of recall only in the adequateness of the result, which in turn is due to the more complete control. The fourth and final step in the completed operation, belief, is most characteristic of all. It alone is in some degree peculiar to the process under discussion. As

THE PSYCHOLOGY OF REASONING

has been repeatedly said, any new construction that is believed to be adequate is rational. How the construction has been attained is a matter of relative indifference. Historically the discussions of thinking in all of its forms have centered about truth and the methods of establishing or demonstrating truth. So far has this gone that the modes of obtaining truth have largely been lost sight of as compared with the methods of establishing its validity. In fact, proof has frequently been confused with obtaining a solution. While it may attach to many other psychological operations, belief has been most often discussed in connection with reasoning, and in that sense it is the one of our four stages peculiar to reasoning.

If reasoning has these many psychological analogues and relations, it must be remembered that it is not a topic for psychology alone, but that the entire science of logic is devoted primarily to its consideration. Our account of reasoning would be obviously one-sided did we neglect logic's discussions of the problem. That the attitude of logic is essentially different from that of psychology is evident from the different division that it makes of the reasoning operations. The universal practice of the

THE PLACE OF REASONING

logician is to divide reasoning into conception, judgment, and inference. There is by no means such complete agreement, however, as to what these different terms represent in the way of processes. In fact from the attitude that logic takes toward reasoning, the terms refer rather to the products of mental operations than to the operations themselves. Formal logic at least is mainly concerned with thinking as it is expressed in words. In consequence, the outcomes of the operations alone are considered, and that with little reference to the occasions or laws that give rise to them. The concept for formal logic is defined as a term that applies to or represents a class of individuals, or an abstract quality. The term itself is any word that represents an object. Judgment is the process of connecting the terms or, in the static form that is usually discussed, it is the combination of two terms. Inference is the combination of judgments. Three judgments in the syllogistic reasoning unite in the development of a new truth.

Any attempt to answer the question, what psychological operations are behind these elements recognized by formal logic, involves numerous difficulties. Perhaps the most im-

THE PSYCHOLOGY OF REASONING

portant is the disagreement among the logicians themselves as to what the operations are, or even as to the exact parts of the total problem to which the different words are to be applied. The formal logic definitions have been abandoned or modified in many particulars by the more modern logicians, who are more concerned with the real operations that lie behind the words than the older men. If we correlate the words of the logician with the phases above, we find that the only term that exactly applies is the word judgment, which is the approximate equivalent of appreciating the difficulty. Even here, to obtain our correspondence, we must accept the definition of the modern logician that the judgment is the application of meaning to the given. Inference covers much the same operation as the solution of the problem but the formal logician is not so much concerned with the process as with the proof. He takes the solution for granted as it is expressed in words and contents himself with asking if the result is correct, or how it can be shown to be correct. The process is overshadowed by the proof in his use of the term inference. The traditional equivalent of inference, the syllogism, is wholly devoted to proof and does not

THE PLACE OF REASONING

at all correspond to the process of obtaining the solution. Inference, then, covers three of the processes that we have distinguished: the solution of the problem, belief, and the methods of inducing belief, proof. Two terms of the logician then correspond closely enough with the phases of the reasoning process as they present themselves to the psychologist to be used to designate them. One preliminary problem from each group must be discussed, these are: first, the nature of belief, or the criterion of truth which has been discussed now and again by the logician but which is certainly a psychological problem from one of its aspects; and second, the problem of the concept that is now ordinarily combined with the problem of meaning. Discussion of the influence of the purpose and the wider relations of the elements of the thinking process must be incidental to the other phases of the subject. Our problems for discussion are, then: (1) What is it that gives belief? (2) How is it possible for the concrete mental image or word to represent abstract qualities and for the one to be representative of the many? (3) What is the process of judging or appreciating, ordinarily appreciating a difficulty? (4) What is the process of infer-

THE PSYCHOLOGY OF REASONING

ence, or of obviating a difficulty, or solving a problem? (5) In what ways may the truth of the conclusion be established, the part really emphasized by the traditional logic? In the discussion of each we shall emphasize the psychological position but shall also attempt to do justice to the results and methods of the logician.

The general difference in the standpoint of the logician and the psychologist will serve to throw light upon the discussion of the particular problem. The most important of these is probably the relation of the thinking process to the concrete individual consciousness. The psychologist makes reasoning one operation among many; the logician, or at least several modern logicians, deny that thinking ever goes on in the mind that the psychologist investigates. Bradley and Bosanquet and more recently Husserl make the latter assertion with great emphasis. The former two men accept Mill's description of consciousness as accurate and when they find no possibility of a satisfactory explanation of reasoning in Mill's system, insist that it must go on in some higher realm, a world of meaning that is apart from the individual consciousness, although perhaps connected

THE PLACE OF REASONING

with it in some unassignable way. Husserl, similarly, argues that the results of reasoning must be true absolutely and universally while mental processes are always relative to the experience of that individual, and need be true for that individual alone. To the first argument, the psychologist must reply that it is against all direct evidence to assume that thinking does not go on in consciousness. The results are always expressed through the individual and bear marks of the individual peculiarities of the thinker. If the psychology of Mill is inadequate, the obvious course is to develop an adequate psychology. It does not follow that one must look to a supra-mental realm for the seat of thought. As a matter of fact the universal mind or world of meanings of Bradley is much more like the real mind as the psychologist describes it to-day than is the mind pictured by Mill and his contemporaries.

The argument of Husserl brings out most clearly the fundamental difference between the methods and attitudes of the logician and the psychologist. The aim of the logician is to discover a theory that shall give knowledge the character that he believes it to have. The aim

THE PSYCHOLOGY OF REASONING

of the psychologist is to examine consciousness as he finds it with no preconceived idea of what the outcome may be. He follows out the accepted methods and accepts without question the results that they give. There is more than a suggestion in the one attitude of working for an answer, as the schoolboy solves a problem. The other too often forgets to ask whether the outcome of his method is adequate to the demands made upon it. Both methods have disadvantages. Working for an answer is not likely to foster impartial investigation, but too great indifference to the outcome in matters as complicated as the working of mind makes it possible for an entirely inadequate solution to be palmed off as adequate. It is as if, in calculating the balance in the bank, one should find a much smaller sum than expected. Three courses would be open. One might assert that the result was impossible and that in consequence the laws of addition and subtraction ordinarily used must be wrong; one might accept the outcome as infallible because it is the expression of methods known beyond question to be true; or one might accept the correctness of the methods, but believe that some mistake had been made in the application and look back

THE PLACE OF REASONING

over the results to see if each part of the operation had been properly carried out. The first course is a caricature of the logician's conclusion with reference to reasoning; the second exaggerates the method of the older psychology, or at least of some older psychologists; the third is the every day common sense practice. Obviously the intermediate course is the only one that gives promise of success.

With reference to these more fundamental problems, the present discussion will assume that thinking goes on in the human consciousness, and that it is possible to determine the laws and conditions of thinking from an examination of mind. The investigation shall make use of the generally accepted methods, but an eye will be kept constantly on the results of the method to make sure that the conclusions agree roughly with the accepted character of the thinking operations. If the results are manifestly inadequate to the actual attainments of reasoning, the methods will be re-examined to determine the source of error, if any exist. It will also be kept in mind that reasoning may not really be of the character popularly assigned to it. Its accomplishments must be examined from time to time to make sure that

THE PSYCHOLOGY OF REASONING

they are actual, not pretended. By these methods and on these presuppositions we may proceed to our investigation of belief, of the nature of meaning and the concept, of judgment and inference, and of proof.

CHAPTER II

BELIEF

The problem of belief is, in one of its aspects, the problem of truth. As such, discussions of belief have been numerous in the history of philosophy. The earliest form of the doctrine is closely intermingled with the discussions of the ultimate nature of things. One solution of this character we find in Plato's ideas whose existence gave certainty and stability to the more transient mental images. Later the discussions of the principle of sufficient reason in Leibniz, in Pascal and other logical writers approach the problem from a different point of view. Most of the tests were of a logical character alone. Pascal, to be sure, asserted that the clearness and definiteness of an idea gave it the warrant of truth. But it is only with the modern writers that we find the distinctly psychological problem put as we would put it, viz.: what is it that distinguishes the true from the false as psychological states? The first of

THE PSYCHOLOGY OF REASONING

the modern writers to recognize the problem was Hume, who made belief depend upon the clearness or distinctness of ideas. The famous classification of mental states into impressions and ideas gives one answer to the question. Impressions must be accepted because they are intense, ideas may be denied if indistinct. Belief in ideas is also made to depend upon the strength of the associations that bring them into consciousness. For us the essential aspect of the theory is that it is the first to give an empirical basis for belief, to discover a criterion that lies in consciousness itself and is immediately open to investigation. Whatever credit may be due to Hume as the pioneer in the problem, as the first who recognized the possibility of answering the question in a scientific way, we must reject his explanation as at best but partial and incomplete. While in general vivid experiences are accepted and the faint and indefinite are doubted or rejected, there are notable exceptions. Many intense experiences are not believed to be real and a still larger number of faint impressions are at once given credence. Many detected hallucinations and illusions are of considerable intensity, while very many faint impressions are accepted at their first appear-

BELIEF

ance without question. Certain of our beliefs then may depend in part upon the intensity and vividness of mental states, but this quality is not to be regarded as important. The exceptions are fully as important as the rule.

- Bain formulated the next of the more significant types of theory. This has two independent criteria or explanations of belief. The first is his suggestion that to ask why we believe is to put the less important and less easily answered of two possible questions. For belief is the natural process, psychologically—is negative; while doubt is positive. We believe everything that comes to consciousness unopposed. What requires explanation is doubt. Belief is the original process in the mind of the child. He does not doubt until he has accumulated a considerable amount of knowledge, until he has attained a relatively high stage in the development of intelligence. The other phase of this theory, that action is the test of belief, has had even a larger place historically. We believe anything that we are prepared to act upon. Belief comes with action however action may have been initiated. The first mentioned characteristic of belief may be derived from this, for from the beginning there is a natural ten-

THE PSYCHOLOGY OF REASONING

dency to respond to every sense impression.

The main criticism to be passed upon Bain's theory affects its importance not its truth, and this applies only to the one criterion, action. There can be no doubt that when we act, we have ordinarily believed, but it may be a question whether we do not act because we believe, rather than believe because we act. In other words, one questions whether it is not much more important to explain action in terms of belief than to explain belief in terms of action. What really concerns one is to determine the conditions of belief and of action, not to learn that one believes when one is ready to act. Action comes as the outgrowth of belief, or at most as another expression of the same set of conditions. What we are really anxious to determine is whether the idea is justifiable and likely to prove profitable before action has tested it. It might be urged too that belief often seems to grow through action, but in these cases it is probable that the resulting belief comes from the success of the action, rather than through the mere action itself. Some acts to be sure give rise to belief whose results are indifferent to belief; frequent repetition gives rise to a habit and the habitual movement dis-

BELIEF

tracts from consideration of circumstances that might arouse suspicion. This is not real belief. More usually however action serves like the experiment in science to confirm or refute. Not the act but the new evidence it furnishes is the source of belief. Of the two effects of action in furthering belief, one ordinarily gives mere pretense before the world, not real belief; the other derives its value not from the act itself, but from its results, an intellectual contribution that frequently destroys belief. We may readily grant the statement that action is an excellent test,—if we believe, we are willing to act in accordance with our belief, but action does not give rise to belief in any great number of cases. The second thesis that Bain upholds is at once important and true. Credulity is natural, doubt comes only at a relatively late stage in intellectual development. It follows that what needs discussion and interpretation is not belief but doubt, or disbelief, and we shall take advantage of the suggestion when we come to the positive, more constructive part of our discussion.

The third man to emphasize the importance of belief was Brentano, although he contributes little to the detailed analysis of the state as

THE PSYCHOLOGY OF REASONING

such. Brentano makes belief identical with judgment. Unlike Bain, he insists that mental states are at first indifferent to truth and must be judged before they become either true or false. Brentano positively declines to state in what the process of belief consists, or to give it any conditions. He argues strenuously that it is an unanalyzable process. We believe and that is all that can be said. This can mean only that the process has not yet been analyzed or that Brentano does not care to undertake the task. He does in practice carry out his definition and makes judgment, or belief, one of the elements of mind on the same level as sensation or action. The truth or falsity of Brentano's theory can be established only by successful completion or admitted failure of the analysis. While then in the recent history of the reasoning theories Brentano's theory of judgment bulks large, his theory of belief deserves mention only from the importance he attaches to it in the total system.

One of the last great advances made is by James. Belief in the materials of perception is for James as for Hume dependent upon the intensity or vividness of the impression itself, upon the actions and emotions aroused and

BELIEF

upon the degree to which it fits in with the habits of observation and action. Self-consistency is the most important condition of belief in matters of theory. Less important are the emotional and experiential aspects. The struggle between the different theories to satisfy our æsthetic and emotional needs eventuates in a compromise that is given belief. In one passage belief is defined as "the emotional reaction of the entire man upon an object." This definition seems, however, to be subordinated to the others. We also find in James strong insistence upon the statement that one can by habitual endeavor make one's self believe what could not be believed at first. The most characteristic of all these conditions is the assertion that belief comes from the consistency of the object or statement with itself. The enlargement of this idea into the several systems of belief that are all consistent, each within itself, but inconsistent with each other, is significant of a tendency to demand for belief a wider consistency of the thing believed with other experiences.

If we look back over the theories of belief, we see that each man has accepted many elements from his predecessors but has subordinated

THE PSYCHOLOGY OF REASONING

them to the criteria that he was himself concerned to establish. If we combine all, we have the general statement that anything is believed that is intense or vivid, we believe that upon which we are willing to act and which harmonizes with our old habits and our emotional nature, provided always that it does not manifest inconsistencies within itself. So much we may accept as present in some degree in most states of belief. Any one except self-consistency may be absent and belief be present. We may believe in things that are not sensuously clear or vivid, we may even believe statements that are opposed to our habitual emotions and habits, if they are presented under new and striking conditions. We probably do not believe anything that we are not willing to act upon, but it is a question whether that tells us more of the conditions of belief or of the conditions of action. The objection to the theories mentioned is not that each does not contain some truth but that, taken together, they do not cover all cases of belief. In some instances we have belief where no one of them is present, and in others all may be present and belief still be absent. We have perceptions that are vivid and in harmony with our emotional mood and

BELIEF

past habits of response, that we do not believe, and we hear stories that are all of these things and self-consistent as well that we still do not believe, while more rarely we believe assertions or accept experiences that possess none of these qualities.

We may begin our own constructive task with at least one fact gained from the history of the theories. This is Bain's assertion that belief is a negative and natural process that attaches to all mental states unless there is some good reason to the contrary; that one must seek reasons for doubt, not for belief. Anything that enters mind is normally at once accepted as true. Doubt or disbelief on the contrary must have some positive ground, and consequently arises only with sophistication and on the basis of positive evidence. In opposition to Brentano it seems that there is no moment when any perception or idea stands in consciousness as a mere given that is neither believed nor disbelieved. Introspection seems to show no moment of suspended judgment. An object or statement is accepted or rejected at once. On its entrance it stands before consciousness a thing believed, a thing denied belief or a thing in doubt. These attitudes may

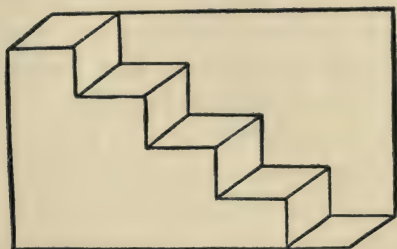
THE PSYCHOLOGY OF REASONING

succeed one another; a statement may be first believed, then disbelieved or doubted; but never, so far as my experience goes, does it stand without evaluation as to its truth. Even when there is intentional suspension of judgment as a consequence of a warning that the question is difficult or that there is danger of being misled, what is suspended is not so much belief as the usual consequences of belief, action or the final stamp of approval. Brentano's assertion that in its initial stages the impression is indifferent to belief seems not to have been the result of actual experience or observation so much as a construction based on considerations of theory. If one were to suppose with Brentano that belief were an independent mental process without relation to anything else, it might be necessary or convenient to have two operations rather than one involved in the acceptance of an impression by consciousness. Brentano seems to have emphasized the needs of his psychological system rather than the facts of experience.

Accepting belief as a natural and immediate state of consciousness, we must begin our analysis of the state and its conditions not with belief, but with its opposite, disbelief, or the more def-

BELIEF

inite quality, doubt. For disbelief seems usually to be belief in something else, doubt is unique. We may begin our study by observing an instance of doubt on the perceptual level where the phenomenon appears in its simplest, most analyzable form. One may take an old example in the illusion of reversible perspective. In the figure one sees at first glance a



flight of steps clearly and unambiguously drawn. A second glance shows that the figure is part of a broken wall under which one might take shelter from rain. The interpretation changes with the attitude. When one thinks of walking up and down on the steps, the steps reappear. As the attitude changes in this way from moment to moment, the interpretation varies. If one takes the experiment seriously, he is puzzled as long as the fluctuation continues. This is the typical attitude of doubt. The

THE PSYCHOLOGY OF REASONING

alternation is usually unpleasant when the problem is real. Complicated strain sensations are likely to arise and these add a new element to the unpleasantness. Qualitatively, then, doubt is unpleasant, and is marked by somewhat complicated strains. On the psychological side, the conditions of the fluctuations are the antecedent ideas or mental attitudes. When one is in a "flight of steps" attitude, one sees steps; when in a "broken wall" attitude, the overhanging wall dominates. The attitude is induced and changed by the words, but it might have changed spontaneously had the words been lacking. The fluctuation ceases and belief replaces doubt when the person looking at the picture learns that the drawing is perfectly plane; that the alternation is not due to perspective, and that the fluctuations arise from the ideas brought to bear on the interpretation of the presentation rather than in the presentation itself.

This simple illustration is typical of all cases of doubt in perception. It is very frequently possible to look at an object from more than one point of view. How it will be seen depends upon these points of view and the resulting interpretation will shift with the shifting atti-

BELIEF

tude. As long as two points of view are possible or are actually operative in changing the interpretation, there will be doubt; when one or the other, or some third that transcends them, is definitely established, doubt vanishes and belief ensues. Very frequently alternation of interpretation is lacking; one context alone is dominant, and belief is present from the start. There is not even definite recognition of the possibility of doubt, so no conscious belief. The first interpretation persists and is taken as true without being consciously regarded as true or false.

It will be noted in a case of this kind that there is no third distinct process of disbelief. One takes the figure as either concave or convex, and believes either one or the other. It is possible, however, to express belief in one interpretation directly or indirectly as disbelief of the alternative interpretation. Whether one uses one form or the other, depends very largely upon the verbal context. If some one suggests that the figure above is concave, while one is seeing it convex, one is more likely to deny the concavity than to assert the convexity. The rejection of some other person's definite assertion is almost the only occasion for using the

THE PSYCHOLOGY OF REASONING

negative form. In this case the negative is altogether a matter of language, not of psychology. The only case in which disbelief is not really belief in something else is when no interpretation is satisfactory. Each suggestion is rejected. As a result, the negative form is used without any definite positive disposition of the object in consciousness. Then doubt unresolved gives rise to the negative. In any case the negative does not present a new psychological category. The only psychological processes are doubt and belief. We might note, too, that what is asserted of the logical negative by Bradley holds in the psychology of disbelief. Bradley, it will be recalled, asserts that one never gives a proposition the negative form except upon positive grounds; that one never makes a negative statement except upon some definite occasion. The same holds of disbelief. One would never assert disbelief in the existence of an object or of an interpretation of an object unless the interpretation had been asserted and rejected, or unless the interpretation had suggested itself to the speaker and it had later been seen that some other was more stable. In the figure just discussed one would not say that it was not concave unless some one had

BELIEF

suggested the possibility of seeing it as concave and one had not succeeded in the attempt. One does not assert disbelief at random. There are thousands of statements that might be denied of the figure, that it was red, virtuous, of curved lines, etc., but none of these are denied because they do not suggest themselves to anyone as possible.

Doubt concerning a statement of more general fact or theory has very much the same explanation. Doubt arises whenever a statement can be brought into two or more contexts and changes as the context changes. Doubt, then, is an expression of the fluctuation that results from viewing a statement from different points of view. It carries with it, also, the implication that it is impossible to view it in one way for any length of time. Thus, the relation between body and mind is believed to be causal as long as one considers the similarities between the relation that subsists here and the relation of cause and effect as it is recognized in physics or in the practical world by the practical man. On the other hand, for some, at least, the idea refuses to fit into general experience when one emphasizes the differences between the physical and mental

THE PSYCHOLOGY OF REASONING

aspects, and attempts to apply the generally accepted principle of the conservation of energy. As long as the two ways of regarding the problem alternate, there will be doubt. Doubt ceases and we have belief whenever one way of regarding the subject vanishes and the other remains in unchallenged supremacy on the mental field. As soon, for example, as consciousness is accepted as a form of energy, the conflict with the doctrine of conservation disappears and the psychologist becomes an interactionist. If the difference between conscious states and energy is emphasized, and the differences between the relation of the mental and the physical and the causal relation in the purely physical realm increase in prominence, the man refuses belief in interaction, and either remains in doubt or becomes a parallelist, which is probably essentially the same outcome.

Again, one may believe in socialism if one considers the evident disparity between the rewards of different individuals who may be regarded as of the same ability or as of the same degree of desert. One is firmly opposed to socialism when men are regarded as essentially very different in ability, and ability and desert are identified, or it is assumed that men

BELIEF

differ in their deserts as completely as they do in ability. Just so long as the two sets of experiences fluctuate before the mind, one will be in doubt as to which of the abstract principles is the more desirable. When one persists, it is by that very fact believed. On a subject that depends upon knowledge, belief cannot be permanent. As long as there is no scientific knowledge about the extent of individual variation in ability, or general agreement about the relation between ability and desert, every man will have his socialistic moments and his individualistic moments, according as life has presented one feature or another to him in his immediate past. And individuals will be predominantly individualistic or socialistic as life as a whole has presented the advantages or the disadvantages of the present individualistic society. This presentation may have been in matters of practice or it may have been in matters of theory. In any case, we have belief in one theory or the other just so long as one set of experiences predominates in consciousness; doubt enters whenever there is rivalry between two sets of experience or alternating dominance of one and the other. Any similar instance of doubt or belief seems to

THE PSYCHOLOGY OF REASONING

reduce to the same factors. Here again we may say that disbelief is no third state. When belief is lost in one statement, belief in something else or doubt ensues.

If we turn from the particular to the general, belief may be said to arise when any statement or interpretation harmonizes with experience as a whole, with the knowledge of the individual. We must, that is, go beyond the self-consistency of the statement or object to its consistency with the wider whole. There is nothing particularly indefinite or mysterious about this statement if one will but accept the conclusion of modern psychology that no experience ever stands alone, but that even the apparently most simple mental operation really expresses large parts of earlier experience. In the simple perception, for example, we have the action of a vast number of facts acquired days and years before. No apparently discrete element is really discrete, but is the focusing point of consciousness as a whole. Every impression that enters consciousness does so by the positive or permissive action of forces derived from much of past experience. It follows then that to assert that belief depends upon very much of our earlier experience, in fact upon all that

BELIEF

is active at the moment, does not require any new complication of the mechanism of mind. All that is necessary is to assume that the same factors that control attention or that direct the course of associations or constitute the attitude toward the interpretation of the entering impression in perception, are also the factors that pass upon the truth or the falsity of the resulting object or assertion. Since experiential factors are present and in active control there is no reason why they should not also be called upon to determine whether the product of their action is to be accepted or rejected. The operation of passing upon the product of a mental operation is part of the process of producing it. One usually takes place at the same time as the other and is always a result of the same kind of force. It is true, the product may linger in memory for a moment, to be tested after it has been formed. During this period forces or factors that were not operative before may enter to take part in the testing process and, if the new product fails to square with them as well as with those earlier effective, it will be rejected. It is difficult to say what limits of age may be put upon the experiences that play a part in the operation of testing. Certain it is

THE PSYCHOLOGY OF REASONING

that many very remote elements may have their part in it. Remnants of knowledge or of habit acquired in early childhood may at times have their effect upon belief, and it is difficult to draw a definite line in time and to say that all earlier experiences were without influence, all later ones were effective.

Not all experience is organized into perfectly consistent systems. As a result we find that not all of experience, or even all that is essential, need be active at any one moment in the testing. In consequence, as different systems come into prominence successively, the attitude toward the construct will vary and with this variation the interpretation fluctuates and the consequent doubt supervenes. This gives the change in mental attitude. Doubt is due to the alternating dominance of systems of experience that have not been altogether coördinated one with another. In this as in many other connections it is seen that this attitude or purpose varies from moment to moment. When two more or less opposed systems succeed one another closely, the whole train of alternating interpretations ensues and the unsteadiness results in alternating beliefs. These characterize the doubt consciousness. In some matters and

BELIEF

at some moments one context and one alone is present. That constitutes or characterizes the momentarily settled conviction. In other matters several systems or contexts conflict and no single organization can be made to include them all. Conviction is lacking or unsettled and, unless settled, some shadowing of the disturbance gives rise to the general experience of doubt. ✓

This dependence of belief upon earlier experiences and upon the reaction of earlier acquired knowledge upon the momentary product is evidenced by a consideration, in the individual or in the race, of the change in beliefs with growth in knowledge. Some evidence can also be obtained for it from a study of the conditions of partial and temporary beliefs and of other somewhat pathological or unusual forms. The slightest observation shows that growth in knowledge is invariably accompanied by corresponding change in belief. The man of the early historic periods accepted any statement not in direct conflict with his experience. He peopled the universe with fairies and super-human beings, with witches and weir-wolves; he put implicit confidence in absurd cures for disease and in spells and incantations. It is only

THE PSYCHOLOGY OF REASONING

as man has grown in knowledge, and experiences have become sufficiently numerous and may be treated with sufficient discrimination to make evident the conflict of the new with the old, that doubt is at all possible. Similarly if we trace the development of accepted theory in any branch of science we find that the theories of any period harmonize with the observation and accumulated knowledge of the period. These theories are changed only as new facts and observations appear. So the explanation of perception and all action at a distance by corpuscular emanations was held to as long as there were no facts in direct opposition. As facts accumulated that would not fit into the theoretical scheme, people began to doubt it. It was abandoned in one field after another as the facts that would not fit became numerous enough to overwhelm it, and a new coördination was hit upon that would be less in conflict with the observations. It is interesting to note that the senses that have been most useful or could be most easily investigated were the first to accept the explanation in terms of wave motion.

In the individual, too, we find, as experiences accumulate, the same increase in the severity of the tests that are applied. Children accept

BELIEF

with relatively little question anything that their senses give them, or that anyone tells them. The phrase childlike credulity is an accurate indication of the facts. As they grow older or as knowledge accumulates they become more and more difficult to satisfy. Their credulity disappears with increasing age and intelligence. Fewer and fewer general statements will be believed because fewer are in harmony with their knowledge. Their beliefs become at once more restricted and more trustworthy when tested by the generally accepted standards. The individual of restricted experience shares with the child ready belief and restricted doubt. Illustrations of both of these statements will undoubtedly be suggested to all without further illustration. Both lines of evolution tend to confirm our general thesis that belief is an immediate and complete expression of the earlier acquired knowledge of the individual so far as he has it ready to pass upon the new experiences and statements which present themselves.

The evidence in the same direction from the cases of partial or artificial belief is no less striking. Perhaps the most complete instance in the normal life of impaired critical capacity toward a mental construction is to be found in

THE PSYCHOLOGY OF REASONING

the dream state. It is common experience that while dreaming we believe the dream to be real, no matter how bizarre or unnatural the construction that results. However when we recall the dream on waking there is no longer any belief that it could possibly be true. The whole elaborate structure falls like a house of cards. The explanation fits very easily into our theory. For whatever theory of sleep one may choose, one is bound to assume that during the dream state part of the brain is awake while the greater part is still asleep. As a result the control of association in the dream is the expression of but a small portion of the cortex, of only a small portion of the accumulated experience. The construction that harmonizes with the partial experience that has controlled its development, is entirely out of harmony with the wider experience that passes upon it when it is recalled. When viewed in the dim twilight of consciousness it is believed, but when exposed to the full daylight of complete consciousness, it becomes at once "the stuff of which dreams are made." The adequacy of belief is a function of the completeness of the experience that passes upon it. The same phenomenon can be illustrated even more completely perhaps in the

BELIEF

misplaced beliefs of the insane. Whenever the association tracts are impaired and the corresponding experiences thereby blotted out of the nervous system, belief is impaired in much the same degree as knowledge. That delusions persist and are accepted as real is a defect primarily of belief. There is no reasonably fertile mind in which untrue combinations of experience do not make their appearance from time to time, but in the sane individual they are refused belief and so do not persist for any length of time. In the paranoiac the critical powers are reduced and the delusions persist and are permitted to lead to action.

Cases in which hasty belief is revised at leisure are also illustrations of the same general principle. The ill-considered acts arise from acceptance of a course of action, or from assent to a proposition while dominated by partial knowledge. The belief given is in the light of less than the sum-total of the individual's knowledge of the matter in question, certainly in the light of less than the total amount of knowledge available to him at the time. The later regret, if it comes as often it does, before the decision has been expressed in action and new experience thereby accumulated, is in terms

THE PSYCHOLOGY OF REASONING

of the wider knowledge that is then brought to bear upon the subject. When the unused knowledge is brought to bear, the old belief is found to be out of harmony with important elements of experience and immediate rejection follows. If the rejection is not so complete but there is wavering between two groups of experience, belief is replaced by doubt. In all of these cases there is appeal from a partial experience to a complete experience, and the decision of the full bench stands.

But these cases of absolute belief followed by just as complete disbelief are not the only cases of belief that throw light upon our problem. Many instances of partial belief persist over long intervals of time and these are recognized, too, as partial beliefs during the entire period of their persistence. Most artistic and æsthetic beliefs come under this head. When one reads a novel there is belief of a kind, but not complete belief. One believes in the work as a study of character under the conditions that are assumed, and of the characters as they are assumed to exist. In a word, one puts one's self artificially in the mood of the author and believes that were the conditions as he assumed them to be when he wrote, the outcome would

BELIEF

be as he asserts it to be. If he departs from his tacit assumptions we at once say that his art is false. As long as his development harmonizes with his presuppositions we are content to believe; his art is true. Were one at any moment to look at the statements as one would historic fact, it would appear that one did not believe and could not believe. One consciously reads with an artificially limited experience, and as long as the experience that tests is limited in this way, one believes in part, but is aware that the belief is in part. It is probable that the limitation of the testing experience arises automatically at the suggestion of the peculiar style of the novelist. This is not restricted to the "once upon a time" of the story book, but the whole tenor of the construction and even the outside appearance of the book carries with it an incentive to look at the story from the attitude of partial belief. This suggestion serves unconsciously to limit the experience of the reader in the same way that the experience of the writer was limited while writing. Here as in the dream state so long as the experience that tests is the same as the experience that produces, there is belief. Whenever the experience is widened, as it is when one

THE PSYCHOLOGY OF REASONING

asks the question, "Is this really true?" belief departs.

This testing of the presentation by a partial experience, a partial knowledge, is characteristic of the artistic consciousness wherever we find it. In music, in painting, in sculpture, as in the novel and on the stage, what is characteristic of the attitude of the artist during the development and of the appreciator in his enjoyment of the works of art, is the limitation of the extent of the guiding and testing experience. With him one is willing and able for the moment to emphasize one phase of one's experience and through that, one phase of life, while everything else is for the moment excluded. Enjoyment comes from the fact that one can for a time banish all conflicting considerations and look with an eye single to that phase or aspect of life. The fact that the figure is of marble, not flesh, that the painting is flat, that the scenery on the stage is canvas, is not permitted to interfere with the truth that is depicted. If one fails to perceive the picture's meaning, persists in looking in the light of a complete experience or under any other set of experiences than that intended by the artist, there is no truth and so no pleasure. In this

BELIEF

respect one must agree with Schiller and his numerous disciples that art is like play. In play, too, we are content to put aside many of the realities of life and to make believe for the moment that they do not exist. And the importance of play is due to the fact that all that makes for disbelief can be momentarily excluded from our consciousness, that we may judge the actions of ourselves and others leniently and partially. The child with smaller amounts of experience, and with fewer of the stern habits of life and business has considerably less difficulty in reducing to the minimum the knowledge by which he tests events and consequently has less difficulty in playing and more enjoyment from the simpler plays. All that distinguishes these beliefs of the artistic consciousness from the beliefs of the dream state, or from the beliefs of the paranoiac in his delusions is that they are consciously partial, and that they may be dissolved at will whenever the necessities of daily life demand. All alike illustrate the dependence of belief upon the accumulated experience, particularly upon the accumulated experiences that chance for the moment to be dominant.

We might class among these temporary and

THE PSYCHOLOGY OF REASONING

partial beliefs the belief under definitely formulated suppositions, that are not in themselves known to exist. One is constantly saying, granted that the new president is a believer in civil service, we shall have a better administration, or at least the appointment of better qualified men to the offices. Of course no assumption is made as to the truth, but we are recognizing a definite possible limitation of our experience and permitting our mind to run on under its control. This is a frequent and important practical attitude. That it is allied to the partial belief of the artistic and the play consciousness is apparent. We need but to mention it in passing in this connection because it must be given extended discussion in connection with judgment and inference. It is at the basis of the hypothetical propositions that we shall have occasion to discuss later.

All departures from belief and modified forms of belief, as well as belief itself, seem to justify the original assertion that belief is one of the necessary results of the coöperation of older experiences with new in the formation of any mental process. As all experiences contribute in some small degree to the control of mental operations and to an amplification of

BELIEF

the simple datum of sense or to the hardly less simple resultant from association, so all experiences pass upon the accuracy of each perception and of each statement made and heard by the speaker or his auditor. If this be the correct analysis of belief, it follows that beliefs grow, that they can not be made or even controlled. Belief can change only with change in knowledge. One can no more change one's belief arbitrarily than one can change one's height or one's health. Given one stage in the development of knowledge, one kind of belief is just as certain to result as an unsupported ball is certain to fall to the ground. True the same man does not believe the same thing at all times, but it is also true that the same set of experiences is not active at all times in any one man. One can change the belief of any individual either by giving him new and different experiences, or by so presenting a statement that it shall arouse a different set of experiences to pass upon the statement. Both methods are applied in practical argumentation. The effectiveness of a plea depends upon the success with which new groups of experiences can be roused to give the attitude that is desired. When the attitude is properly aroused belief follows as

THE PSYCHOLOGY OF REASONING

a matter of course. It is asserted by some religious cults that certain forms of belief can and should be aroused at will. This is not far from the doctrine that Professor James holds in his "Will to Believe." From the point of view we have reached, it would be just as absurd to exhort anyone to change his belief without new evidence or new interpretation of old evidence as it would to exhort him to hasten his pulse, or to increase his stature. Even if he endeavored to comply, the most that could result would be a pretense before the world, in which there would be neither practical efficiency nor any great virtue. And as a matter of fact will and belief are undoubtedly common products of the same deeper lying forces. Whatever appeals to us strongly enough to tempt us to desire to believe, by the very same appeal compels belief. The only exceptions are found where social rewards come from pretending to believe. And in these cases we probably should be able to carry on the pretense without belief, but it is a question how long it would be before pretense gave belief. It is as necessary to believe to will as it is to will to believe; indeed, the former is the normal and usual order.

In this discussion as throughout I have paid

BELIEF

no attention to two important elements in the experiences that make for belief. These are the effects of actual trial, and the influences of society. I have omitted to mention them, not because they are in my opinion unimportant, for they are probably the two most important kinds of experience in the development of belief, but because the more prominent factor in belief is the fact of the interaction of experiences rather than the nature of any of the experiences that interact. The most important single group of facts concerned in deciding how we shall believe are the results of earlier activities. Every idea has been put to some kind of practical test, and the results of this test or tests constitute the most important part of the ideas in control of later belief. Furthermore, whenever belief comes we are likely to test it by acting upon it, where in the nature of the case action is possible. It is in this that we find the truth of Bain's doctrine and of modern pragmatism. Far from disputing the statement, I am concerned only to point out that the grounds of action and of belief are one, and that both are to be found in the accumulated experiences of the individual, many of which in turn have been derived from the results of action.

THE PSYCHOLOGY OF REASONING

Hardly to be distinguished from the active experiences in importance are the elements in belief that come from the interaction of the individual with his fellows. Most experiences are of social origin. Practically all of our knowledge, at least all of our early knowledge on all important matters, is taken on hearsay. With the borrowed knowledge there comes borrowed belief. The religion, politics, medical dogmas and so on of the young and of the masses are obtained at second hand, and too often from unintelligent or prejudiced sources. As a result, the belief of the community becomes the belief of the individual. Any slight or even great discrepancy in these subjects between actual outcome and the cherished belief is covered by the fact that the products of observation are never clear-cut, that it is necessary to compare results over long periods or to collect numerous cases, before a conclusion can be established. Ignorance of statistics, or indifference to them as compared with the few cases that come under actual observation, sustains the original ignorant belief. In this sense the majority of beliefs have a social origin, although it must be asserted that advance or change in belief comes from the individual, not

BELIEF

from society. The individual is ever originating new theories which he refers to society for its approval.

So far we have been dealing with the question of the conditions and functions of belief, but we have not raised the question whether there is a distinctive quality that attaches to the conscious state that is believed, that marks it off from the state that is refused belief or held in suspense. On this question there seems to be much difference of opinion. Brentano and Wundt would apparently make belief a feeling on much the same level as any other feeling. Brentano would even make it one of the three fundamental conscious processes. Others from their silence apparently do not give assent. Certain it is that the function is easier to demonstrate than the existence of a state or structure. Personally I can discover in a moment of belief nothing but the stable persistence of the idea or state that is believed. If doubt is functionally the positive process, one might suspect that it might also be the process to which the distinguishing structural characteristic attaches. In a measure the conjecture corresponds to observed fact. But even doubt has few enough characteristics. In doubt one state of opinion

THE PSYCHOLOGY OF REASONING

follows another, consciousness is unstable. In extreme cases some positive discomfort may show itself. Sometimes it seems that the competing masses of experience reveal themselves even when there is no definite presence of the corresponding interpretation. Certain it is that we doubt in many cases when there is no evidence in consciousness of what the alternative is to be. What gives doubt is often very difficult to fix upon and still more difficult to describe. Much the same answer must be given if we ask what marks off the artistic consciousness of partial belief from the matter-of-fact attitude of total belief. All that can be said is that we never make a mistake in the actual interpretation, but that we cannot, or at least I cannot, pick out any particular quality that justifies or characterizes the state. The function is easy to establish, the structure is hard to find. Belief is the harmony of the part that is believed with the whole of experience. Doubt, not belief, is the positive process. Whatever is not doubted is believed. Doubt is characterized by a conflict of interpretations of an object or a statement. The consciousness of doubt or belief comes not from the particular element but from the interacting masses of

BELIEF

experience. The quality of doubt or belief is difficult to describe. It is not even possible to say whether there is a quality of belief apart from the total consciousness of everything else.

CHAPTER III

MEANING AND THE CONCEPT

A second characteristic of the reasoning operation is that it deals with general statements, is ordinarily concerned, not with bare meaningless particulars, but with things that have meaning, and with statements and operations that may apply to classes not to individuals. One may think of man and mean no particular man, as well as John Smith. One may think of an abstract quality in no particular connection as well as of a single object of that quality. This fact is important for all formal logic and for modern logic and psychology. At least four phases of this problem may be distinguished. First,—how is it possible for a single mental state or process to stand for or represent all of the particulars that are meant when we use the term? Second,—how is it possible for the concrete mental image to represent abstract qualities? Third,—what is it that represents the particular and the abstract? And

MEANING AND THE CONCEPT

finally,—what is the nature of the abstract itself that is represented? These four questions have not all presented themselves to the same minds. Perhaps all four questions could not present themselves definitely to the same mind at the same time for it is not improbable that some are mutually exclusive, but all have played a part in the theory of logic and psychology, and it would probably be possible to find all represented at any period of the history of logic, if not of psychology.

We can group the treatment of the problems about two general topics. These are, first, what is meaning; second, what is the concept. About the one cluster the various theories as to how one mental state may do duty for many, or the concrete for the abstract; the other discusses the question of what it is that represents or is represented. The one may be discussed under meaning, the other under the concept. True, these two terms have not always been restricted to the significance I am giving them. Each has been used to designate the fact I have designated by the other. And even when most closely defined, the two functions have much in common. But a fringe of each is always distinct and it seems that more is to be gained by

THE PSYCHOLOGY OF REASONING

retaining the two terms and circumscribing the meaning of each than by attempting to fuse the two problems into one, similar as they may be in general.

Currency was given to the word and to the problem of meaning by the logical writings of Bradley and Bosanquet. Bradley used it to permit him to speak of mental operations in some other terms than those used by Mill in his psychology. He accepted Mill's description as true of the concrete actual mind, but as he rightly insists, we need something else to explain the thinking processes. This need is satisfied by the world of meanings, connected with the images in a way that he does not make at all explicit. In Bradley's words every idea has two aspects. From one point of view it is merely an image, a psychological somewhat, and nothing more. From the other it is a symbol of a general idea or of a universal meaning. In this use it is no longer individual; it is typical, representative. For Bosanquet the image that one uses when one thinks stands in the same relation to the thing, that signal flags do to the messages. The flag with its color and form is not at all similar to the message that it transmits, but serves its representative func-

MEANING AND THE CONCEPT

tion admirably. In this sense Bradley and Bosanquet both insist that mental images never are what they mean. They are just bare existences in crude outline, but they mean real flesh and blood beings in the most concrete sense.

It must be said of the theory of Bradley and Bosanquet that the thing meant is not some more concrete process, what in the language of the man in the street would be called a thing, but is always a more developed general idea that is, as it always has been, a prototype of all particulars. They also tend to use the term meaning in a second sense as this general idea which is represented by the image. The system of general ideas they would call the world of meanings. In this world all is closely interconnected. It is a world of completely developed relations and is a world of universals, of types, not of concrete or individual ideas. They were driven to this world, as has been said above, because they could not understand how thinking could go on in a mind of the kind that Mill describes where there is nothing but discrete and disconnected elements, with no principle of interrelation wider than the associative connection between contiguous or successive ideas. The process of coming into mind seems to

THE PSYCHOLOGY OF REASONING

them to have two parts. First the given comes into the concrete mind, into the world of bare images, and then into the world of meanings or of universals. This distinction is perhaps more marked for Bradley than for Bosanquet, but even for the latter the two realms seem to be distinct, and how anything may pass from one to the other constitutes one of the important problems of logic.

The theories of the nature of the concept developed earlier and along a slightly different line. The attack upon the problem was much more direct, but the results in many respects have been similar. Historically, the problem of the concept has been primarily the problem of representation. The earlier history of the discussions of the concept contains many unnecessary complications. We need not go into these, but we can proceed at once to a statement of the problem as it stands to-day. In simplest terms the representative function of any mental state depends upon its associations, its connections with many other mental processes. This representative function has been traced by Wundt to the fact that the image is replaceable by any one of a large group of other images that have been in consciousness. The triangle

MEANING AND THE CONCEPT

thought or even seen on the page is representative because it has been connected at different times with all other triangles and any one of them might be substituted for it. The statement is true for the facts of recall, but does not literally describe the way the connection was established. The representative image could not have been seen simultaneously with each particular that it represents. The number of particulars is too great, and observation shows that the concept means things with which it could not have been associated.

The genesis of the concept tends to confirm the statement that it depends in part upon the associations it has made. The greater the number of relations into which the representative image has entered, the wider is its meaning. For the child the word, color, can mean only the particular shades that he has seen. Every new color presented enriches the word by just so much. The same enrichment of the concept would be present if the representative in consciousness were not a word, but were some particular image or anything else that had come to be representative of the mass of particular elements. If, for example, one has always connected a right angle triangle with other forms

THE PSYCHOLOGY OF REASONING

of triangle, or what is the more natural order has always connected the right triangle with each kind of triangle as it is presented, the right triangle would come to represent all others in thought. Whenever any form is to be treated in a mental operation, what would be present in mind would be not the form itself, but would be the right triangle. Representation would then be fundamentally dependent upon the fact that the mental process in question might be replaced by any one of the particular elements without having it necessary to change any of the uses to which the imagery actually used might be put. This possibility of replacement depends primarily upon the associative connections of the representative element, but one would hardly dare to say that everything that it represents has actually been associated with it at some time in the past.

In addition to the connections that may be reinstated, some conscious sign that these particular connections and no others are in existence undoubtedly attaches to the element itself. Thus, when one is using a right triangle as representatives of all triangles, it will be used in different ways and with more associates than when one is using the same mental impression

MEANING AND THE CONCEPT

as a symbol for right triangles alone, and that in spite of the fact that the image is identical in the two cases. What this difference is it is not easy to say from an analysis of the conscious content. Wundt calls it the concept feeling, but that is not to describe it and Wundt is always very ready with names for processes, vague feeling processes at least, that give very little enlightenment concerning the nature of the mental state and are accompanied by very little description of the feelings that are designated. That there is something in consciousness that checks a use of the mental state when one is inclined to use it in a way that the concrete things it represents would not permit, seems to me indisputable, but how much consciousness may attach to this inhibiting function is a question that I am not prepared to answer on the basis of my own introspection. If there be any consciousness, it must correspond to the wider connections of the mental state at the moment and not to the mental state itself. There can not be consciousness of all the associations into which it has entered in the past because, as we have seen, not all of the associates are effective in controlling the uses to which the concept may be put. Our triangle

THE PSYCHOLOGY OF REASONING

would have one set of uses and on our present theory one set of feelings when it meant one thing; another use and another feeling when it represented another. Certainly, it is hardly to be supposed that the image as a separate element has a different quality when it represents one set of particulars, and another when it represents another set. For the same image, considered as an image, does duty not for one set of particulars alone, but for many such sets. If the quality were the differentia it would be necessary to assume that each representing element would have as many possible qualities as there were different sets of particulars that it might represent. Evidently, then, the consciousness that marks the representative element as representative, as distinct from the same state as non-representative, cannot be found in the mental state itself. The consciousness that a mental state is representative in one way at one time and in another way at another is not to be related to the core of the image. Physiologically, at least, the consciousness must be dependent upon the connections, as is evident from the fact that the uses to which the element is put depend for their nature upon the experience of the individual in the

MEANING AND THE CONCEPT

past. Even this can not be the whole story, however, because the function shows that what is effective is not the entire mass of associates, but merely one small group that changes from moment to moment with the group of particulars represented.

If on the one hand the consciousness that marks the mental state as representative does not belong to the element alone, but to its connections, and on the other hand does not belong to all of its connections but to certain ones only, it is evidently essential to discover the elements or processes that contribute something to the consciousness of the moment as well as serve to extend the consciousness of the image beyond the simple state. This, I think, we may discover in the purpose or momentary mental set that controls the course of association at any moment. This purpose or context it is that limits the associates that may be aroused by our triangle. At one time it limits the effective associates to right triangles of all shapes and forms, and at another moment it extends the possibility of excitation to all triangles of any kind whatsoever. If the problem be understood to deal with the properties of but one kind of triangle the associates are

THE PSYCHOLOGY OF REASONING

limited by this understanding, this context, to that one sort of figure. If the purpose be to attain some knowledge of triangles in general, the field of representation is extended to cover all types. Apparently, then, the consciousness that attaches to the representative image is not confined to that process alone, but is extended to include all the ideas that are likely to be recalled by that element under the given controlling purpose, in the given context. If we look at the matter physiologically, we may say that consciousness during one of these processes of representation is not restricted to the nerve cell or group of nerve cells that would ordinarily be aroused by what we call the simple sensation, but that it corresponds to that set of nerve cells plus all the other nerve cells and connections of nerve cells that might be aroused by it at that moment and in that context. What gives variety to the consciousness as the representative function changes, is the different set of associated cells that are aroused to partial activity in the different contexts. Whether the cells are actually partly aroused, are in a state of slight excitation, or the consciousness attaches to the mere tendency toward association, is a matter of indifference

MEANING AND THE CONCEPT

to our present problem. We would find the consciousness that marks a mental state as representative, not in the state itself, but in the wider group of connections in which it is presented, and in certain associated processes which it tends to arouse. It is not even certain that any particular consciousness attaches to the state to distinguish it as representative from the same state as non-representative. Certain it is that the uses to which it can be put are different in the two cases and it is more important to discover the difference in use than to determine the quality of consciousness. Another aspect of the concept brings us back close to the problem of meaning as it has already been discussed in connection with the logic of Bradley and Bosanquet. We think of things as general and of abstract qualities. The conscious representatives of things in general correspond very closely to the meaning of Bradley. It remains to decide whether the concepts as they are found in mind at all resemble the elements of the world of meanings as they are described by the modern logicians.

The first element of the description furnished by the neo-Hegelians suggestive of the real mind is that the world of meanings is typical.

THE PSYCHOLOGY OF REASONING

If we examine any bit of thinking, particularly any bit of abstract representation, we find that we have in mind not the image of any individual thing, but a more general type that resembles no one experience more than any other, but which stands for all. This typical idea is the one most used; the experience that will satisfy the largest number of practical needs. We are likely to regard the typical as real, as opposed to the departures from it that are treated as mere ideas. Illustrations are to be found most readily perhaps in the realm of space perception. I have seen my study table quite as often as a trapezoid as I have as a rectangle, yet I never think of it as anything other than as having a square top with the legs perpendicular to the top. All the other perceptions have vanished, this persists. It alone is recalled whenever I think of the table. Similar types or standards of reference tend to grow up for a class as well as for the different forms that are assumed by the same object under the conditions of perception. The table that serves me as a standard of reference in my thinking processes is some piece of furniture that has all of the essentials of the class with none of the parts that are present for adornment only. The type

MEANING AND THE CONCEPT

in this instance is much less definitely represented, and in some minds is, as will be seen later, not definitely pictured at all. But even at that, what remains is probably to be regarded as a part or product of the typical image.

That this tendency to think in terms of types or standards is very general is not assumed upon the basis of chance observation and introspection alone, but has been demonstrated in a number of experimental investigations. In the recognition experiments of Lehmann¹ we have what is perhaps the *locus classicus*. Lehmann, it will be remembered, found that in recognizing grays, there was always a tendency to recognize shades in terms of the words that had been assigned on the original presentation. As many different shades could be recognized on representation as there were words in the vocabulary of the subject. Early there were six words, and six shades could be immediately recognized. When numbers were associated with the shades, and were repeated often enough to become well fixed, as many shades could be kept distinct as there were numbers. Practice carried the numbers to nine, and it

¹ Lehmann: "Ueber das Wiedererkennen," *Phil. Studien*, VII. 469.

THE PSYCHOLOGY OF REASONING

was found that the process of recognition consisted in assigning the color that was presented to its number. The number seemed to serve as the standard for recognition. Similarly, if one attempts to recall colors and grays, it will be noticed that all can be recalled that have been given definite names, that correspond to distinct types. These results have since been confirmed by a number of observers. Moreover, in some instances it is not necessary to recall the word, but the standard may be present as a vague image or even something less than an image. Here the reference is to the standard, but the standard is ideated in somewhat indefinite terms. Thus, in Dr. Hayden's¹ experiments on the recognition of lifted weights, the second weight was not compared with the first, but each was compared with a standard. This standard was only vaguely pictured, but there was little difficulty in being sure that the weight offered was heavier or lighter than the subjective standard. Similar results have been found in estimating or comparing lengths of movements. Schumann found standards of time that seemed to develop in the course of

¹ Hayden: "Memory for Lifted Weights," *Am. Jour. Psych.*, 13, p. 497.

MEANING AND THE CONCEPT

short intervals of practice, in comparison with which intervals were judged to be short or long. In both of the last mentioned cases motor adjustments undoubtedly get established as the result of frequent repetitions. The same sort of thing is to be seen in the *Einstellung* of Müller and Schumann in the experiments on lifted weights. Weights seemed very heavy or very light according to the motor adjustment that had been established by the earlier experiments of the series. The sort of adjustment that is established for a brief interval in these experiments can be found in the other cases to extend over a longer period of time. In fact, in some of the experiments they were found to persist and to serve as standards of reference from day to day and even throughout the whole period of the experimentation.

Turn where you will in every day life, standards have the same tendency to develop. These serve to represent the particulars, and through frequent use they come always to replace the particulars in thought. They are usually deviations from some one single element of those that they typify, and are related to all. These types or standards are not confined to intensities or extents or qualities, although they are

THE PSYCHOLOGY OF REASONING

easier to demonstrate there, but objects of all kinds tend to crystallize about some one common form. They are convenient for recalling the particulars, and while each particular that may reappear will be different from the standard in some respect, the difference is not sufficient to impair the value of the result. What we remember and what we think or reason about is always this type, never the particular. Even when we attempt to recall some particular as different from the type, we ordinarily recall the type first and then recall the departures from it. In this, the process of recall is not different from the process of description. If you describe a new object you recall an established type and state departures from it. The world that we have in memory or in reason is not the sum of particular experiences; it is always the mass of particular experiences worked over and crystallized about standards. This simplification of the world is an enormous convenience. The appearance of the simplification marks the beginning of a really effective understanding. The savage is said to remember a path by recalling each turn or object along the way. The civilized man remembers only the general direction with reference to north or

MEANING AND THE CONCEPT

south and by means of this reference to the compass is able at the expense of less effort to accomplish as much or more than the man of better concrete memory.

The pictures of the world that are offered by science show similar tendencies to group facts about typical forms. The pictures of the world that the chemist gives us of a mass of atoms in interaction, or that the physicist describes in his various forms of energy, are to be regarded as types that connect and represent large numbers of discrete events. They are like all individual facts, but are identical with none. Taking these various statements together, we must agree with Bradley and Bosanquet that the world of thought and even the world of memory is not the mass of absolutely separate concrete experiences that is ordinarily used to explain it. The real mind differs from Mill's mass of discrete elements in two respects. In the first place it is composed of types rather than of concrete impressions; in the second place the various types are all interrelated, they do not stand in isolation one from the other. In both of these particulars the world of memory is like the neo-Hegelian world of universals. It differs from that world of mean-

THE PSYCHOLOGY OF REASONING

ings, however, in that the types are apparently not preformed and in existence before the experience of the individual, but seem to develop in and through experience.

Certain experiments give a clue to the way in which types originate from the concrete experiences. One of the earlier investigations that throw some light on the problem was carried on by Leuba.¹ He found a tendency for impressions when recalled to group about the central values of the series in which they occurred when first seen. Somewhat the same result was obtained in investigating the memory for numbers by Xilliez,² a little later. The digits were displaced in memory toward the average. Still later, Bentley³ found that there was always a displacement toward the background,—that colors tended to be remembered as lighter than they actually were when exposed in a light room and tended to become darker when shown in the dark. These results might be interpreted as an indication that there is a

¹ Leuba: "A Suggestion of a Law of Sense Memory," *American Journal of Psychology*, Vol. 5, p. 370.

² Xilliez: "La continuité des chiffres dans la memoire," *L'Année psychologique*, 1895, p. 201.

³ Bentley: "The Qualitative Fidelity of the Memory Image," *American Journal of Psychology*, Vol. 11, p. 1.

MEANING AND THE CONCEPT

tendency, unconscious and uncontrollable, for concrete experiences to fuse into a single element and that the tendency is for each element of a group to be displaced toward the center of the mass. If we continue the argument it would seem altogether probable that the mass that results from the fusion would in time crystallize completely about the center, and that with the completion of the process we should have a type that represented the mass. As many types would develop as there were centers of crystallization, and the number of centers would be determined by the practical necessities. Where a group of experiences was of frequent occurrence and of great practical importance there would be a larger number of lines of cleavage than in less familiar and less important material. The lines of cleavage themselves would similarly correspond to the needs of the individual or social group with which one has to do. Among people of our own race, there are innumerable distinctions of type. People all tend to fall somewhat into types consciously or unconsciously, but the types are numerous. The centers of crystallization are ordinarily immediate friends. However the groups may have originated, they

THE PSYCHOLOGY OF REASONING

serve our practical purposes of recognition, memory and description. In a race that is unfamiliar the number of types is much smaller, and the capacity for distinguishing very slight. It is a familiar saying that all Chinamen look alike, and I presume that in China the same statement *mutatis mutandum* would be made of Caucasians. One word of caution may be necessary to guard against the assumption that these elements which fuse are present as actual sensations at all times. Of course what is present is a nervous disposition, and the only evidence of the fusion is the fact that after a large number of experiences, we find the type making its appearance as the representative of the group.

It is not at all improbable that a large part of the development of the type is dependent upon the results of a method of trial and error. One representation is tried and as soon as it is seen not to fit in with all of the other experiences it is rejected or modified in some way and a new type or a modification of the old one is tried. This process is continued and results in a constant shifting of types. The type of one stage will work for the experiences that have accumulated so far. These trials are not con-

MEANING AND THE CONCEPT

scious, nor are we aware that we are either developing types or testing them. All that can be made out is that we always have a type of one kind or another and that the types are in flux, gradual for our more familiar objects and experiences, rather rapid for the newer objects and experiences.

These types are not restricted to objects in the usual sense of the word, but cover relations as well. Differences in duration have crystallized about the time idea; in size and direction have given rise to space differences of greater or less definiteness. It is entirely conceivable that a larger number of relations than we have might have become fixed in the chaos of differences, but only those that were practically important to us did get established. The directions of the compass, for example, seem grounded in the nature of things, but there is no reason why, if it had been convenient, there might not have been six cardinal points rather than four, or seven rather than six. For the mariner who needs to use the finer divisions south-southeast is probably as much of a type, as much of a fixed thing, as north is to us. His need has by trial developed his types. In the duodecimal system twelve seemed fully as much a fixed

THE PSYCHOLOGY OF REASONING

thing as ten for us. There is no reason to suppose that there might not be a greater number of ways in which objects might differ than those that we recognize. It is conceivable that things might be different in other respects than in intensity, quality, duration and extent. But these by trial have been found convenient and so are fully established; the other differences are thrown together under the general head of departures from the four fixed relations. If we can imagine the child consciousness as existing without these types, we can get some idea of what chaos of impression might be. There is probably for the young child neither up nor down, right nor left, before nor after, greater nor less. All is without difference, or at least without order in difference. One would know that two things were different, but would have no idea how. It would be like the threshold discriminations of the laboratory where the awareness of difference makes its appearance before the awareness of the direction of the difference. Gradually as different sorts of difference would get grouped about some one striking type there would be the beginning of appreciation. Growth in definiteness would be exactly *pari passu* with the development of the

MEANING AND THE CONCEPT

type. Some of us who know little of music have this confusion when discussing the musical qualities, or the qualities of the simple tones. Some, I speak for myself, find it difficult to tell pitch from intensity, or higher from lower in the way of tonal differences. The reason lies undoubtedly in the fact that no types have crystallized out, that there are no points of reference. For them, use of musical terms is parrot-like repetition, without meaning.

If we ask what the imagery of the type may be, how it is thought, the answer is, look at your consciousness of any object and whatever you find there is the type. It undoubtedly varies from individual to individual. The difference in imagery is one example of the fact. Some have found it convenient to drop all but the visual elements, others all but the auditory, others again all but the motor. Some have combinations of these, some seem to do without any definite imagery of any kind. This fact of the disappearance of some elements is itself an evidence of types. Entire sense departments may drop out and be typified by others for all practical purposes. In exactly the same way any one element of the sense department may disappear, and the type still persist. In

THE PSYCHOLOGY OF REASONING

this case the consciousness is probably of the connections rather than of the center. In brief, then, types have developed from experience to explain experience, although they may be exactly like no single experience. The problem of the connection between the type or meaning and the concrete consciousness now presents itself. How, in the words of the neo-Hegelian logician, does the concrete idea come to stand for this interconnected mass of meanings? The mass of meanings exists even if it is not independent of and antecedent to experience. Here again one must be careful not to attack problems that have no real existence. It has been tacitly assumed that the representative and the type were in some measure identical and that the type is the representative of the concrete experiences and of discrete events. This, I think, can be extended explicitly in the statement that the world of meanings and the world of types is not merely the representative of discrete antecedent events in consciousness, but that the world of types or meanings is throughout the only consciousness that we have, that it is identical with the empirical human consciousness wherever it presents itself. Thought is not in particular mental images. When we

MEANING AND THE CONCEPT

think, the type or standard is in consciousness and nothing else. Nor is the monopolizing of consciousness by types and standards confined to reasoning and memory. In perception as well, we are conscious of nothing but the type, of nothing but the meaning. What persists as we look at an article of furniture is not the trapezoid or rhomboid that ordinarily falls upon the retina, but is the rectangle that experiences of other kinds have taught us most accurately represents the object. We may go farther. Not only do we not remember the trapezoids and rhomboids, but we do not even perceive them, under the usual conditions. If a person, skilled in drawing or in observation of spatial forms, looks at the table top carefully, he can convince himself that the image that falls upon the retina is not rectangular, but if one looks in the ordinary practical way what one actually sees is the rectangular table top, not the rhomboid. The uninstructed person has probably never for a moment thought of anything but the rectangle in connection with the table top. He has received nothing but the meaning; the sensational contributions have never really entered his consciousness.

The same sort of illustration of the universal

THE PSYCHOLOGY OF REASONING

dominance of the meaning or the type can be found in any part of the field of space perception. We always see objects of their standard size, not of the size they may chance to have upon the retina. This standard size is the size they have at the usual distance or, if tools, where we are in the habit of using them. A person is of the size that he has upon the retina when at conversational distance, a house is seen relatively much smaller because we must be farther away to appreciate it, a hammer is of the size that it would have at arm's length, etc., etc. Sensational elements that are of no value are not seen, as in the case of contrast colors and after-images. In hearing a foreign language there is no real perception until it is understood. The words are merely a jumble of sounds until types develop within the language itself to which they may be referred. Before that however they are not meaningless in the absolute sense but they are referred to the category of mere noise. As knowledge grows, the number of types or standards increases, until with complete knowledge we have a complete set of preformed types. At the moment of perception these start out to meet the incoming stimulus and the result is what we know as the

MEANING AND THE CONCEPT

object or percept. Of course in thus emphasizing the influence of the type, I have no intention to deny the importance of the stimulus. Were one to assert that the type were everything, stimulus nothing, there would be no possibility of accounting for the constant change in types and standards that goes on in the individual and has gone on in the race. But the type is too often overlooked to the undue emphasis of the stimulus, and an over emphasis upon the type may only serve to restore the normal balance.

All perception, then, as well as all thinking is in terms of the meaning rather than in terms of crude discrete memory images. The meanings develop out of experience, as well as serve to give order to experience. In fact they serve in the developed consciousness to constitute experience, not merely to give it form from without. If we compare the results of our discussion with the theory of the neo-Hegelian logicians, we find that we are in agreement with them, that the meaning is the real material of reasoning. We differ from them, however, in insisting that meanings develop out of experience, and are consequently not independent of experience, and in believing that instead of

THE PSYCHOLOGY OF REASONING

standing above the concrete consciousness they constitute the concrete consciousness,—that we know nothing else. The meaningful and the conscious are identical and, conversely, the meaningless and the unconscious are identical terms.

This raises another question. If there is nothing in consciousness but meanings, what is meant in psychological discussions by making sensations and their associations the basis of all explanation? The answer is simple in the light of our present position. Sensations and the laws for the connection of sensation are merely types that have developed in the course of the attempts to explain mental processes in the same way that right angles have developed in the course of the attempts to explain the articles of furniture about. They are the most simple forms of experience that have been selected as typical of all mental operations, they serve to represent the thought processes as atoms do the chemical operations, or nerve cells the operations of the brain. They are themselves meanings, not sensations in the sense of being crude and immediate results of the action of stimuli. Just as the visual image is brought before conscious-

MEANING AND THE CONCEPT

ness to explain the processes of perception when we become aware that the problem exists, so sensations are developed to explain the mental operations in general when we turn around on the mental operation to ask how it works and what it is. In this sense sensation and the interrelations of sensations may be regarded as types, but the meaning and other departures from the type may be fully as near the truth of concrete operation.

Our description of the nature of the meaning would be incomplete if we did not connect its characteristic of constituting a type with the characteristic of being representative of the particulars and of being in connection with the particulars that it is to represent and with other meanings. All that we said of the way in which one mental process may represent others is true of our type or meaning. As has been said, the type is a product of a large number of experiences, and that means probably that the nervous connections of the different experiences that go to make up the type are in a large measure identical. In so far as the nervous processes at the basis of the particulars are not identical with those of the meaning or the type and so in a state of activity at the moment that

THE PSYCHOLOGY OF REASONING

the type is in consciousness, they are closely associated with it, and through this associative connection are undoubtedly active in some small degree. The meaning is then what it is,—in the first place, because the nervous processes at the basis of the particulars are in large measure identical; secondly, because those nerve processes that correspond to divergent particulars are also in some degree excited by irradiation over association paths. The consciousness of meaning like the consciousness of representation is undoubtedly correlated with the activity of a very wide-spread nervous activity. This process of interaction between the meaning and the particular is a twofold one. Because of the close relation of nerve paths the meaning tends to call up the particular when it appears and is controlled in its effect by that fact; but, on the other hand, as we have seen, the particular when it appears in consciousness tends to arouse the general, the type or meaning. For that reason no particular can have entered consciousness without having aroused the meaning, and consequently every particular must be associated with the type that represents it. The type must have been present at its birth. It can only really get into the mental world by the

MEANING AND THE CONCEPT

aid of the meaning. If a stimulus is to enter consciousness it must be reacted upon and when reacted upon it becomes a meaning.

If one were to push the matter but a step farther, one could find a sense in which meaning could be designated with Gore¹ as the reaction of the organism. Every group of particulars tends to find expression in action. There are a limited number of motor responses and in consequence the particulars of the group must have a common motor response, just as they must have sensory processes that are in large part common or closely connected. While I am not inclined to lay as much stress upon the motor side of the process as are many of my colleagues, yet it is undoubtedly true that the motor processes contribute something to the total consciousness, and whatever they do contribute must be added to the meaning. I am inclined to believe that particulars have a common motor response because they have a common meaning rather than that they have a common meaning because they have a common motor response. But this difference may be one of emphasis not of principle. The divergence in the theories at this point is not essen-

¹ Dewey: "Studies in Logical Theory," p. 184.

THE PSYCHOLOGY OF REASONING

tial to the doctrine of meaning that has been sketched, however wide it may be as to the relative importance of the motor processes in consciousness.

If we turn now to the old group of problems treated historically in connection with the concept, we find that they are in many respects identical with the problems of meaning. The old problem that seems to have survived most definitely in the formal treatises on pedagogy was how can we tell the concept from the percept? What is in consciousness when we think a general? The best answer that can be given to-day is that anything may be in mind as this representative, we might say anything or nothing. It is always the type. But the type may be of the form that we call the particular image, it may be a word, or there may be nothing at all of which one can be certain. In fact what makes a concept a concept is not the quality or character of the conscious element, but the connections into which it enters. If we begin with a particular as a well developed type, feature after feature may drop away and the function still remain the same. The structure, if structure there be, is at most nothing more than a center of crystallization. Its

MEANING AND THE CONCEPT

essence consists in the wide-spread connections. These we have seen probably contribute some conscious quality to the total and it is not at all impossible that the center may disappear as a conscious process and the consciousness of relation still persist. In fact, if we look at the entire process as one of adjustment, the movements may undoubtedly go on that would be called out by a type after the consciousness has worn off. There is no reason to assume that the representative function and even the representative or concept feeling might not persist in much the same way after all the consciousness of the original particular, or even of the type as a structure, had ceased to appear. Of more importance than any analogy that would make it possible is the fact that Professor Woodworth has established in several fields that it is possible, even usual, in some individuals for the representative function to be present without any noticeable content. As I understand it he would agree with me that imageless thought is primarily characterized by the fact of close nervous connection. I am not sure that he would not have more consciousness than the bare awareness of connection to which I have reduced concept feeling, or at

THE PSYCHOLOGY OF REASONING

least I am not sure that he would not insist that there must be a different kind of consciousness. Structurally, then, percept and concept may be identical. The same type might be present in each. What distinguishes is the function. Function in this case depends apparently upon the connections into which the process may enter.

We seem to have practically identified the terms meaning and concept. A meaning is essentially the fact that a mental state, whatever its kind, is typical and tends to represent and to be connected with a large number of particulars, but a concept is a concept just because of its connections with these particular impressions that have been experienced in the past. The concept then is the center of reference plus its connections considered from the particulars inward toward the center. Meaning is the fact of reference considered from the center outward. No wonder the two are frequently confused!

There is one other use of the concept that has been prominently represented in the history of logic, formal logic more especially. That is to regard it not as representative of particulars but as itself a mass of qualities or

MEANING AND THE CONCEPT

attributes. Man, for example, not merely refers to all particular men in the way that we have been considering it but it also implies or stands for all human qualities or characteristics. This is a representative function of another kind that depends, however, upon the same law of associative connection. As was seen in the preliminary discussion of psychological principles, we are never conscious at the same moment of all of the characteristics of an object. In fact, only one quality is ordinarily prominent in perception or thought at any one time. The different successive aspects all tend to recall each other, because the less prominent characteristics of each total impression are common. These in turn come to connect the separate prominent characteristics. An object comes in thought to be made up of a core from which many associates irradiate; these latter give the real basis for the belief that it has the composition asserted. It serves to recall all of the prominent characteristics that have been connected with it. In this sense a concept may be regarded as a sum total of qualities each of which has at various times been selected from the mass for special prominence. The representation is on the same

THE PSYCHOLOGY OF REASONING

basis as the representation of particular objects. It is primarily based on associative recall.

The concept snow, for example, is regarded as having the attributes, whiteness, hexagonal form of crystallization, a melting point of 0° centigrade, certain optical properties, etc., etc. This means, if we reduce it to actual fact, that when we have looked at snow at one time we have been struck by its color, at another time we have noted the form of its crystals, at another have melted it and determined the temperature when melting. Now when we think of snow we know that it is possible to regain all of these effects. We do not necessarily mean that all are conscious at any one time, or that the concept is the sum of these attributes in any real sense. All that we have in the concept, psychologically, is the possibility of recalling, when the concept is presented, each of these aspects, each of the perceptions of these phases. We may agree with Sigwart that the concept grows out of separate experiences or judgments.

Two facts stand out from the discussion as the explanation and solution of all of our problems. These are the facts of the wide interrelation and connection of part with part and the

MEANING AND THE CONCEPT

fact that a prominent feature of the consciousness of any thing is the consciousness of its interrelations. The second is the fact that separate experiences lose their identity in a type. This type is a standard that has been found to harmonize the various experiences of the class better than any one of the separate experiences could. As a result it comes to replace the individual in all of our thinking and even to constitute the perception. The stimulus calls it into consciousness rather than its own mere particular conscious accompaniment. The type comes to take over the representative function. It is well adapted to this since all the elements of the class call it out when they enter consciousness and all have therefore been connected with it. That types may have different representative functions at different times is due to the different associates that are in partial activity at these different times. Its consciousness is at all times very largely due to the association paths that irradiate from it. These connections are of two kinds. They tend to lead to the particular experiences, and they tend also to lead to the different aspects or qualities that have come to be connected with the core or type. The one group we call the

THE PSYCHOLOGY OF REASONING

particulars that are represented, the other group is designated the attributes of the concept. The center from which the irradiation takes place may be called the concept; the irradiations themselves, the meaning.

CHAPTER IV

JUDGMENT

The first step toward reasoning, as it is ordinarily treated, is the judgment. The end of reasoning is inference, and judgment is preliminary to inference in practically every system. Judgment prepares the way for inference, either by interpreting the given, as in the more modern discussions, or by providing the material that is to be manipulated in inference as treated in the ordinary formal logic. In judgment, in either use, the problems of reasoning as an active process are approached. Heretofore the materials or the signs of reasoning alone have been considered.

But before the judgment can be discussed, it is necessary to agree on the meaning of the term. The word has been applied in a number of different ways at different times, and there can not now be said to be any particular use that is common or even general. The earliest use in the literature of logic was to designate the

THE PSYCHOLOGY OF REASONING

conjunction of two concepts. Whenever two concepts were combined in a proposition, there was said to be a judgment. This definition is verbal rather than psychological, as are all the definitions of formal logic. That it is not definitely drawn with reference to the psychological processes is well indicated by the great variety of views that have been held as to the nature of the connection between the two concepts and the great difference of opinion as to the nature of the concept itself. The two concepts, subject and predicate, that were regarded as constituting the judgment when united, have been said to be analyzed from a common whole, and to be combined into a common unit when the elements were originally discrete. Judgment is regarded as a process of classification, as the statement of an equation, as an assertion of the existence of the subject, to mention only a few of the more frequent definitions.

The variety and kinds of relations assigned are incompatible with the possibility that the judgment has any close relation to real psychological processes. This opinion is strengthened by the discussion of the concept in the last chapter. The concept that the formal logician has in mind in his treatment is necessarily

JUDGMENT

the concept as a sum of separate qualities. This, as was seen, is not and cannot be a psychological process because we have in mind at any time not all the qualities that are meant by the concept, but one only. We shall have to consider, at a later time, the real relation between the judgment as defined by the formal logic and the mental state. Suffice it now to say that the judgment of formal logic is a matter of language primarily, not of psychology. We must seek the psychological counterpart of the judgment elsewhere.

In our search we may turn for aid from formal logic to the popular uses of the term and to the theories that have been built upon the common-sense meaning. Two meanings of the term are prominent in popular usage. These are as the equivalent of comparison and as evaluation, or comparison with a standard. We speak popularly and even in the accepted psychological nomenclature of the estimation or comparison of intensities or qualities as judgments. The "judgment of lifted weights" is a very familiar term in the psychological vocabulary. We judge when we compare. Judgment and comparison in every day speech are interchangeable. Still more primitive and

THE PSYCHOLOGY OF REASONING

fundamental is the use of judgment as equivalent to evaluation. This, the legal use of the term, is probably the most primitive. When a criminal is sentenced, his crime is appreciated with reference to the scale of crimes recognized by the law, and the penalty that has been accepted as equivalent to the crime is assessed. Objects are judged in the same way in every day life. They are referred to a more or less definite standard.

In addition to the two popular uses of the term two theoretical meanings need to be considered, since it is easy to give them an immediate psychological correlate. These are the use of judgment to designate belief, Brentano's definition, and its use as equivalent to ascribing meaning, the definition most usual in modern logic. Brentano, one of the first of modern psychologists to pay much attention to the logical processes, found judgment in the process of accepting or rejecting any presentation; in attaching or refusing to attach belief to the presentation. The other definition goes back to the conception of meaning as it is used, or was first used, by the neo-Hegelians. Whenever an impression comes to consciousness it is necessary that meaning be attached. To attach

JUDGMENT

meaning is to judge. These two definitions are to be connected with the discussions of the two preceding chapters, and they consequently need no further description at this point. The only characteristic that these four uses of the term judgment have in common, when superficially regarded, is that all seem in some way to apply to the process by which an impression gains entrance to consciousness. It is our problem, then, to determine if there is sufficient similarity between the different processes that have been designated judgment to enable us to reduce them all to one, or if not to select some one phase that we can justify as the type of the process as it is defined both by formal logic and by popular usage and adopt it arbitrarily for our own use.

As a preliminary a more complete examination of each of the four mental operations must be undertaken. For this it will be well to begin with the ascription of meaning, for which the last chapter was a preparation. What can the modern logician mean when he defines judgment as the process of attaching meaning to the given? It has already developed that the meaning is the typical while the given is assumed to be the particular presentation. But

THE PSYCHOLOGY OF REASONING

it also appeared that there was nothing in consciousness but the meaning. The bare given is not a real mental state but so far as can be seen it is entirely a psychological or logical construction. The difficulty with the modern logician's definition of judgment as the application of meaning to the given, is not with the final result but with the starting point, the implication that the given exists as meaningless before it is given meaning. It is not necessary to attach meaning to the given because the given does not exist except as the meaningful. Before it takes on meaning the process can at most be nothing other than the physiological or the physical. Entrance into consciousness and taking on meaning are identical. To assert that judgment is the attachment of meaning to the given, then, comes to mean, in the light of psychological investigation, nothing more than the process of entering consciousness. Judgment and entrance into consciousness are identical. Judgment must apply only to perception, not to memory.

It is necessary, then, to determine what is involved in entering consciousness that is pertinent to the logical operation. Perhaps this may be brought out most easily, if we use

JUDGMENT

Mill's psychology as a *corpus vile*, as did Bradley, to emphasize the importance of the more recent advances. A *corpus vile* probably could not remain a *corpus vile* long if treated sympathetically, so we shall follow our model in departing from the truth, if at all, by emphasizing the crudities of Mill's position rather than the points in which it serves in some measure to explain the actual workings of mind. For Mill mental states were assumed to be particular until they made themselves universal. He apparently believed that it was possible for a group of stimuli to act upon consciousness from without through the sense organ, and to remain just a group of sensations that corresponded to those stimuli when they appeared in consciousness. Amalgamation with anything already in consciousness was incidental, and then was amalgamation only with the few past associates. As opposed to this we have been endeavoring to show, and I think practically all psychologists would agree to-day, that there is some kind of reception of the group of stimuli into a predeveloped system. That this system is necessarily aroused when the stimulus presents itself and that what is seen is not primarily, at least not alone, the group of sensations,

THE PSYCHOLOGY OF REASONING

but is some sort of reaction of consciousness as a whole upon the occasion of the stimulus. This reaction results in the appearance of a mental state that is not merely compounded from the sensations themselves. In many cases it is nothing at all like them, but is some mental construction that in the past has been found best to fit the particular set of circumstances.

This mental construction we shall not go far wrong in describing as a type or standard that develops gradually in consciousness as a result of the manifold experiences of the individual. In our old instance we see the rectangular table top where there is on the retina only the rhomboid. We see the rectangle because experience teaches that if we are to use the table in any way we succeed in our purpose if we treat it as a square; we fail if we assume that the angles are oblique. It fits into what we know as square corners, it will not fit either obtuse or acute angle spaces. We overlook the shadows cast by the retinal blood vessels because we have learned that the objects are to be dissociated from this accompaniment of all observations. The meaning then is the retinal image minus the blood vessels, and we can perceive the blood vessels now only by

JUDGMENT

taking somewhat elaborate precautions. In every case the perception is something that on the basis of numerous tests will fit in with and serve to explain the disconnected discrete experiences. We are not conscious of the discrete experiences themselves. We do not see the retinal blood vessels and then by a more or less elaborate process of reasoning decide that they are not real. They are no more in our consciousness in ordinary vision than are the canals on Mars as we look with the naked eye. We do not first get the crude image and then standardize and correct it; we see the thing as all our experience up to the present moment tells us it would appear were we looking under the most favorable conditions.

In the light of these facts, if we assume that the given is in consciousness in advance of the meaning, it is not possible to hold that judgment is the attribution of meaning to the given. On the contrary meaning makes its appearance at once, and the so-called given, the discrete sense process, is never in consciousness except as it is itself made a meaning to explain consciousness. What is seen is always the predicate of the judgment in the terms of the definition in question; the subject is for us non-

THE PSYCHOLOGY OF REASONING

existent. The process of ascribing meaning is the process of entering consciousness. The type must appear when anything makes its real appearance in the mind. To judge and to perceive become on this definition identical terms, so far as the structural relations of the terms are concerned.

There is much more in common between the perception process as thus defined and the judgment process of Bradley and Bosanquet than there is common to it and the entrance to consciousness of Mill, or at least in the psychology that they attribute to Mill. There is no reason why we should not take the denotation rather than the connotation of their term, and identify the perception process with their judgment. Both, then, apply to the entrance of a stimulus or its concomitant to consciousness. In neither does anything intervene between the physical or physiological and the appreciation of the type, fully interpreted. With this agreement upon the definition and its application, there is nothing left but to turn to examine the conditions antecedent to the judgment. These are to be found in the context and the purpose that dominates the individual at the moment. How we shall interpret anything, what meaning we

JUDGMENT

shall attach to it, depends upon the context into which the entering impression is to be received. Whether an object be one thing or another depends not upon itself, but upon the way it is to be used in the consciousness of the moment. Of the word that I write I see one meaning in one connection, another in a different connection. Sometimes I am not concerned with the use or meaning of the word at all but with how to spell it or whether it will be legible when I return to it at another time. In the way we have been looking at the matter there are a large number of types available at any moment, and we apply now one, now another to the stimulus that presents itself. The resulting consciousness is quite as largely made up of the type as of the occasion that calls out the type. The occasion supplies the cue, the type the material that is perceived, and the problem that is concerning consciousness at the moment, the mental context, serves to select the meaning that shall be aroused on that occasion. When we were discussing the nature of meaning we were somewhat troubled to determine its relation to the particular; now when discussing the concrete particular we have great difficulty, in fact are compelled to admit the im-

THE PSYCHOLOGY OF REASONING

possibility, of keeping it distinct from the type, the meaning.

What is essential to the judgment then on this first definition is the arousal of the type on the occasion of the stimulus, and the selection of some type in harmony with the momentary set of consciousness, the problem that is before it at the moment. These elements we shall find involved in some degree and with appropriate changes in all of the other processes that are designated as judgment. The one exception is perhaps the definition of Brentano that makes judgment the equivalent of accepting any statement or object as true or real. Even with this definition however there are many points of similarity. In the first place belief attaches to practically every perception at the moment that it becomes a perception. Acceptance and rejection are inevitable when anything is experienced. It is part of the process of entering consciousness. Brentano, too, was one of the first men to assert that the judgment was not made up of two parts, but was always single. The operation of judgment involved but one term; there was no necessity in the mind of himself and his school to put things together in order to obtain

JUDGMENT

the judgment. In this their definition would be identical with the one we have been considering, or at least with the interpretation we have given to the definition of the neo-Hegelians. Again, it has been shown that belief arises from the interaction of the accumulated results of experience with the interpretation that is being made at the moment. Meaning, too, has been described as a process that has grown out of experience, and has its validity only in so far as it represents experiences, past as well as present. Both might be described as common results of interacting experiences expressed in a single process or operation. In at least three points there is something in common between belief or its acquirement, and the ascription of meaning. The only point at which it is necessary to emphasize the difference between the two processes is in taking issue with Brentano that an experience might be conscious and be neither affirmed nor denied; that it is possible to hold an entering impression in a psychological purgatory before it is passed upon and either accepted or rejected. We were led to believe that acceptance or rejection is immediate, and one of the conditions of entering conscious-

THE PSYCHOLOGY OF REASONING

ness. If we are permitted to make this change in his statement which it will be recalled is the same change or an analogous one to that made in the definition of Bradley with reference to meaning, the two definitions become identical except for a difference in emphasis. Both have reference to a process that takes place at the moment of entrance to consciousness, both by implication have but a single cognitive element involved in the judgment, and both are the outcome of the reaction of knowledge as a whole upon the entering element. The difference lies in the characteristic of the entrance to consciousness that each emphasizes. One considers merely the truth or falsity, the other the essential quality of the resulting impression. If one must choose between the two, there is no doubt that the interpretation put upon the entering impression is more important for logic than the mere acceptance or rejection of the object or statement, important as that is. While then there is agreement between the two definitions on many essential points, it seems that the definition as the application of meaning covers more of the aspects that are essential for logic than does Brentano's definition in terms of belief.

JUDGMENT

The other two definitions that would make judgment comparison and that would make it evaluation have much in common with the definition of judgment as ascription of meaning. It might seem at first sight that the judgment of comparison involves at least two terms and in so far there is an immediate disparity between the two. In fact, this is the tacit assumption of many logicians, ancient and modern. As a matter of fact, however, modern psychological investigation seems unanimous in the statement that there is but one act in the process of comparison, and that there need be but one term explicitly in consciousness. When one compares, consciousness is not of two elements as discrete, but of one whole made up of two parts. Comparison arises whenever two objects are united in a single experience, and are regarded in the light of the question which is heavier, lighter, or what not. When an object is presented that can be regarded as made up of parts and that object is viewed with reference to any quality of those two parts, comparison results. It is like the attachment of meaning in two important respects. First, that the result of the comparison is stated in the form of a typical difference;

THE PSYCHOLOGY OF REASONING

second, that the difference recognized is dependent upon the purpose. We never express in the judgment the results of comparisons that have not proved important in practice. They are judged with reference only to size or intensity, duration or quality, they are compared in those ways alone that have proved effective in the practical ordering of our world. These ways of comparing again have established results that are schematized or standardized in relations that are almost as firmly established as are the types of things or of persons. Which one of the many ways in which two objects may be compared is selected in terms of the immediate needs or interests? Two lines will be compared at one time with reference to their length, at another with reference to thickness or brightness or some other quality. Only the comparison results that is valuable at the particular moment. In this sense the comparison, like the meaning, is an expression not of the two elements, but of the whole consciousness of the moment. Again the consciousness of difference is immediate. Nothing intervenes between the entrance of the two objects and the attachment of the result of the comparison. They may not be appreciated in any other way

JUDGMENT

than as just brighter, or larger, or whatever the result of the comparison may be. In its mechanism comparison is on exactly the same level as the appreciation of any other meaning. We may go so far as to say that when two objects are compared, they become, in the process of comparison, not two objects but one and that the comparison is the attachment of a meaning to this single object in just the same way that appreciation of its color, or the appreciation that it is an object of one kind not another is the attachment of meaning. The resulting concept is in a degree different from others in that according to Woodworth the content of the concept of relation is difficult to make out. But as we have seen in the discussion of the concept, deficiency in content is not fatal to the concept. In many cases, the concept seems to fulfill its function with little or no content. The fact of interconnection is the essential element, and this the relation has in full measure.

The experiments on comparison already mentioned still farther reduce the essentials of the process. It will be recalled that when some time has elapsed between the presentation of the first and the second of two things to be

THE PSYCHOLOGY OF REASONING

compared, it is not necessary that the first be recalled in order that the comparison result or even that it be accurate. If one has the intention of making the comparison, the concept of relation is aroused on the basis of the presence of the one that is presented, without any representation of the first in sensory terms. The purpose or attitude in this case seems to bridge the gap of time and to call out the concept of relation without definite consciousness of the first member of the pair. What the nervous basis of the process may be, we do not know. Here too we get another effect of the type or standard similar to that which it has in the more usual forms. The comparison is mediate between the first and the standard, and the second and the standard; it is not a direct comparison. The result of the two comparisons and the third that combines them is immediate, no extra time is required for the triple act. The upshot of the study of the results of comparison is that comparison, like the attachment of meaning is a single process, and even ordinarily a process that in strictness involves but a single object.

The tendency to regard comparison and related processes as made up of more than a

JUDGMENT

single term has led to a large amount of confusion in the logical discussions, and, I think, leads to the classification as inferences of many processes that are really judgments in our sense and still more certainly not inferences in the accepted definition of the logicians. Thus Bradley has a long discussion of space relations such as that "if A is to the left of B and C to the right of B, then C must be to the right of A." Bradley assumes that the first statements are in some way the premises from which the final statement is established as a conclusion. This we shall see does not at all agree with any of the interpretations of the nature of the premises that are ordinarily given, or that may be easily given to the syllogism. The first term is in no sense a major premise with the second subordinate to it. It is not a universal statement or even a general statement. We are not prepared to bring forward all of the reasons for regarding it as of a different sort from the relations involved in the syllogism, but can, I think, show that it is really of the same nature as the judgment which we have been treating. The first two terms merely serve to define the spatial conditions that would be ordinarily presented to consciousness at a

THE PSYCHOLOGY OF REASONING

single glance. As we look at an actual series of points arranged as these are, the relation of A and C would be appreciated at once. When the relation of A and B, and of C and B, are described, we are enabled to picture or to appreciate conceptually the relation that A and C have in the same immediate way that we appreciate the relation of two points that are directly seen. The process is exactly on a level with a descriptive narrative that presents to us in concrete form the characteristics of two persons and permits us to compare them with reference to some one characteristic on the basis of the description. We are then in no sense inferring a certain conclusion from the description of the series of acts; we are interpreting them on the basis of a description that takes the place, for us, of immediate observation. There are many similarities between such a process of comparison and the one involved in our appreciation of the relation in space between two points when the relation of each to the common third point is stated. Bradley himself recognizes the fact that there is no major premise in such syllogisms or statements. The major he would supply is some statement to the effect that "the nature of space is such that A is to right of

JUDGMENT

C when," etc. The nature of space is implied in our interpretation of the relation; but this would be implied in the same way that our earlier and classified knowledge is concerned in making any judgment, in the attachment of any meaning. There is no express formulation that gives warrant for the relation and this is necessary if we are to have the syllogism.

It is the same misinterpretation of the nature of space and intensive relations that detracts from the otherwise valuable work of Störring on the process of inference that has been published recently.¹ Störring devotes many pages to the description of the processes that are involved in deciding what the relations of two points or intensities are to each other from statements of other relations of the same points or intensities. His results are exactly what one would expect from the other work that has been done on the nature of comparison. The essential elements in the process are the attitude that is taken toward the problem; and the resulting statement, the reference of the relation to its appropriate concept or type. As in

¹ Störring: Experimentelle Untersuchungen über einfache Schlussprocesse. Archiv für die gesammte Psychologie, Vol. 11, p. 1.

THE PSYCHOLOGY OF REASONING

other forms of comparison there is little appreciation of the mediating process. In some cases the relations that are described are pictured, in others, particularly after practice, even the visualizing disappears and the concept that results is the only consciousness that is involved in the entire process. These results make much more for than against the statement that we have to deal in all such processes not with an inference, as the author supposes, but with a process of interpretation that is in some cases a direct or mediate comparison, in others an interpretation of a relation that is made on the basis of a preliminary description. This interpretation or appreciation is made on the same warrant and by the same methods as the ordinary comparison. That we have several sentences or statements involved is due to the fact that it is necessary to employ several words to take the place of what is ordinarily given in immediate presentation. Here, too, we have judgment as a process of referring entering processes to concepts.

Comparison and the judgments of relation in general, then, are in three respects closely similar to the ascription of meaning. (1) The sort of relation that is appreciated is determined

JUDGMENT

by the mental context, the momentary purpose. This decides in what respect the processes are to be compared, or what relation is to be affirmed to exist between them. (2) The process of comparison is always a single act, no matter how many elements may be concerned, and in many instances that seem to involve several elements all are really combined into one at the moment the comparison is made. (3) The result of the process is the taking over of the relation or of the elements to be considered into a pre-determined conceptual relation, a relation that stands to the particular relation considered in very much the same way that the concept of a thing stands to the particular thing. The only difference that distinguishes this process from the ascription of meaning is that the material involved may, from other points of view than that which prevails at the moment of comparing, be regarded as made up of two or more elements rather than of one. The similarities are certainly more numerous and more important than the differences.

The fourth process that we must consider, the process of evaluation, is one that has come into marked prominence in very recent years. It is particularly desirable that it be brought

THE PSYCHOLOGY OF REASONING

into harmony with the other forms because of the tendency to make it the basis of an entirely distinct process of reasoning, to ground upon it, in fact, an entirely distinct discipline. It has struck many of the modern writers that there are certain important conclusions which do not fall within the range of the ordinary logic and which do not find their explanation in the principles of any of the philosophical sciences. In consequence a foundation has been sought for them in the feelings or in other sources not usually taken into account in logic or in psychology, in the processes ordinarily regarded as the basis of cognitive knowledge. More ultimate apparently than the materials usually considered in logic are the decisions as to what we shall consider fundamentally desirable, is our choice of the ultimate ends of life towards which we shall strive, and of the evils that we shall flee. Not only do we pass these judgments of value upon remote and abstract goods and ends, but we are constantly deciding on little if any rational ground that certain things are to be chosen, others to be abjured. One can apparently say only that the decision is made and affirmed, often with great emphasis and warmth; the grounds are not capable of

JUDGMENT

statement in the ordinary terms. These assertions must be accepted as true; they are accepted as true in the most important matters of life. The only question is as to their justification. Why are they made? How are they true?

Two alternatives are open. The one most favored at present, apparently, is to seek to establish on them a new and independent sort of truth, or at least a new and independent source of truth. This is open to the objection that it would complicate all explanation and make impossible any unification of the kinds of knowledge. It would have the disadvantage, too, of making all, or at least by far the greater part, of our knowledge go back for its ultimate guarantee to vague feeling processes. This disadvantage is all the greater and the course the more lamentable because up to the present there is a tendency to make a mystery of the whole matter, to assert that we must accept these results without reason and without any hope of discovering a reason. In consequence anything that anyone asserts to be true must be true for him and there is no means of contesting its truth. All that can be done is to assert the negative with greater warmth than

THE PSYCHOLOGY OF REASONING

was shown in his assertion of the original affirmative. All major premises of formal logic would go back ultimately to grounds of this kind, and most appreciations that could not be derived syllogistically would depend immediately upon determinations of the sort we are considering. If, then, feeling processes alone determine evaluation they establish the truth of most of the important facts of life.

The other alternative is to take these somewhat vague justifications over into our logic. Admit that ultimately large and important fields of knowledge depend upon them and then do the best that we can to trace the conditions and reasons for the judgments to their sources wherever we may find them. The alternatives present themselves of letting feeling or other vague processes swallow up the cognitive, or to widen our logical and psychological system to include the vaguer kinds of knowledge, or the knowledge that has a less definite warrant. We have already gone a considerable distance in the latter direction in the discussion of the nature of belief. There we found that the warrant for the acceptance or rejection of any object or statement is to be found in the earlier experience in the widest sense of the term, and

JUDGMENT

that but a small number of the sources of the belief in anything or by any person are open to observation at any time. The process of evaluation may very well rest upon similar grounds. Our problem in this connection is to trace the mechanism by which we attain to such evaluations, with particular reference to its similarity to the other forms of judgment.

The process of evaluation shows at least two evidences of having some close dependence upon experience. In the first place the standard changes with experience. What is good for one man is bad for another. My luxuries may be your necessities, my virtues may be your vices. The luxuries of one period of life may become the necessities of a later period. Sums of money that are of large moment to the child are of insignificance, or may be, to the adult. Changes of standards of living and of morality are constantly seen both in the individual and in society. Secondly, the kind of evaluation depends very definitely and clearly upon the more immediate experience at the moment the evaluation is made. Everything may be evaluated, as it may be compared, in a very large number of ways. The evaluation is always with tacit reference to the context. A man may

THE PSYCHOLOGY OF REASONING

be a good man from the point of view of the judge and a bad man in the estimation of the world at large. He may be a good man when judged from the standpoint of a political boss when evaluated in reference to his candidacy for an office, and a bad man when evaluated by the voter. He may be a good man when spoken of in connection with an athletic contest and not a good one when considered from the point of view of academic scholarship. Similar differences in judgment with the variations in the standard of reference may be traced in every object at any moment. There is probably nothing that can be judged in one way alone, and in consequence, nothing upon which only one value can be set. The evaluation of any object will change slowly with the change in the experience of the individual or of a community; it will change almost instantly as it presents itself from different points of view or in different contexts.

Values then are not fixed once and for all, but are growing and changing with growth and change in experience. While one can not easily go behind the value that is set upon anything by an individual and even more truly can not go behind the value that is set upon an act

JUDGMENT

or object by a community or race, it is nevertheless possible to point out that these standards are not all fixed. They belong to the transient empirical realm, not to the realm of eternal verities. One may even hope to be able to change the values of a people by pointing out the disadvantages in practice that inhere in customs long established, and one can more certainly prophesy that even the most definitely established values may change, unless they happen to be rooted in the instincts of the race, or have other permanent warrant in the nature of man or the world. A study of the shift of values as represented in money can be empirically made in connection with any commodity or with a stock on the exchanges. These changes show, as is clear to anyone, the influence of new experiences in connection with that value, the effect of new facts that are no more easy to describe than to say that they relate to popular sentiment. The choice of fundamental ways of living seems to be determined in the same immediate way and to be determined when disturbed by factors that are as little open to investigation although they too would probably be traceable either to instincts or to the influence of some chance environ-

THE PSYCHOLOGY OF REASONING

mental factor, or, what is more probable, to a combination of both. Observation of individuals who are suddenly called upon to readjust the habits and standards of a lifetime through some change in their material possessions shows how largely the common standards of comfort and extravagance are the outgrowth of long experience. It is probable from my own limited observation that individuals who suddenly rise from poverty to affluence either refuse to give over the old standards, or they are for a considerable time altogether without standards. In the one case the individual is characterized as a miser because his old standards of economy and extravagance are entirely out of harmony with his new conditions, or else he becomes a profligate and spendthrift with no idea whatsoever as to how far his new income will permit him to indulge his desires. In either case it is only with the lapse of considerable time and through the influence of many experiences that a new set of standards develops and the man learns to use his money. Similar dependence of moral standards upon experience is evidenced by the periods of sudden change in social organization. Social catastrophes like the French Revolution bring with them the disap-

JUDGMENT

pearance of all moral standards and a resulting moral chaos. Again time and experience alone will avail for the development of new values on a somewhat stable basis. The temporary incompetence of judgment that follows the change of residence between countries of different civilizations or of different monetary units, together with the relatively slow adjustments to the new conditions, are both further evidence of the influence of experience in the development of what often seem to be ultimate standards of moral and material values.

It is true that processes very similar to feelings are effective in the establishment of values even in the most important of our practical as well as in our æsthetic life. Instincts undoubtedly play a considerable part and accumulated experience even a larger part. Values like feelings change, too, if slowly, and the course of the change depends upon the nature of the experience to which the race or the individual may be subjected. This dependence upon experience is common to evaluation and belief, as well as to evaluations and feelings and it seems more satisfactory on the whole to bring the process into relation with belief than with feeling. Belief is equally capable of accounting for

THE PSYCHOLOGY OF REASONING

the immediacy of the process, and offers a more adequate explanation of its sources. This classification will serve, too, to bring it into relation with the other cognitive processes, rather than leave it with a different warrant from that which suffices for the other cognitive states. It does not do injustice to the vagueness of the guarantees of the knowledge, but it makes that vagueness and apparent immediacy apologetic rather than defiant. The attitude toward reasoning of the ordinary sort is not, "This is my dictum; what right have you to examine me?" but it is, "I can not avoid coming to this conclusion, I believe it to be true, but I am sorry to say that the warrant for its existence can not be stated, or even traced through the mass of experience from which I believe it to be derived." One might push the position a step farther, and add, "If the belief process were carefully examined, I have no doubt it would be found that belief, too, is in the same position."

Two results are apparent from the examination of the process of evaluation. The process of evaluation is essentially a process of comparing the given presentation with a standard. Secondly, the standard with which the compari-

JUDGMENT

son is made has developed from experience, is not independent of it. At the same time the standard at the moment of judging is for the individual ultimate and immediate; it gives no evidence of its derivation from and through experience. We have had occasion to indicate that it is similar in its warrant to belief if not merely a subhead under belief. It is also, however, closely related to two of the forms of the judgment that have already been considered. It has two characteristics in common with the judgment processes we have discussed. It is similar to the ascription of meaning in that the developed type or standard is called out at the moment evaluation is made, which may be at the moment that the object enters consciousness. It differs from this ascription of meaning only in that the type does not replace the particular, but serves merely to give it value. It is similar again in so far as the evaluation is immediate when the purpose of evaluation is present. It need not be true that the object is present as a meaning first and then evaluated. More frequently when presented, the object is evaluated and perceived at the same moment. Evaluation is also a single operation, with no explicit presence of any thing, not even of the

THE PSYCHOLOGY OF REASONING

standard that serves to give it value. If evaluation has a touch of the reference to type that is characteristic of the ascription of meaning, it is similar to the judgment of comparison in view of the fact that it involves comparison with that type. It may be brought into still closer relation to the judgment of comparison if the results of the investigations of recognition by Lehmann and others are recalled. It will be remembered that in the comparison of two qualities presented at different times the comparison is ordinarily not of one with the other, but of each with a standard. We might say that the process is an evaluation of each and then a comparison of the evaluations rather than a direct comparison. The standard with which each is evaluated is probably closely related to the standard of absolute evaluation. It comes to seem absolute from frequent use. In fact, in Lehmann's investigation of the color recognition it was, if we may trust the introspection of the observers, the absolute standard that was brought into play. In general, the process of evaluation may be said to be intermediate between the judgment as ascription of meaning, and the judgment as comparison. It has certain elements that are common to each

JUDGMENT

of them. No element is involved in it that is entirely unfamiliar to the other two.

The mechanism of evaluation is also similar in every respect to the mechanism of the other forms of judgment. As we have seen, the mental antecedents of the process are identical with the mental antecedents of ascription of meaning. Just as the context and the purpose of the moment determine what type shall be called out by the object as it enters, what meaning shall be ascribed to it, so here the purpose and context determine what value shall be placed upon it, with which of the many apposite standards it may be compared. The process is not ordinarily accompanied by any peculiar psychological experience. The purpose is ordinarily vaguely conscious and the result is given some fairly distinct sort of representation in some of the concepts of value, but nothing else is apparent. You decide that a painting is valuable or worthless immediately. Even the standard in this case is not definitely ideated. In many cases it would be very difficult to give any ideational form to the standard. The essentials here as everywhere are the purpose in observation and the resulting estimate. Nothing much intervenes. The standard, while

THE PSYCHOLOGY OF REASONING

essential to the process, does not appear in the foreground of the conscious life. This, the most ancient and frequent use of the term judgment, shows many points in common with the others that have grown up since and are common in popular or technical use.

We can bring together the results of this examination in the statement that the process of judging is always simple, the results of the judgment are always to be found in a concept or a type, the direction of the judgment is always in terms of the momentary context or purpose. All forms of judgment are alike, too, in that their occasion is furnished by some stimulus. All begin in some stimulus and end in a meaning or concept. The concept alone is actually conscious. The meaning that is added may be a type of the simple kind that makes the object, it may be a statement of relative intensity between different parts of the total, or it may be an appreciation of the value of the presented with reference to some established standard. In any case it is the reception of a presented stimulus into the unified experience. This reception first gives the stimulus consciousness, first permits it to become a psychological somewhat rather than a mere physical stimulus.

JUDGMENT

The type of the three forms of judgment is susceptible of a single statement as the ascription of meaning to the presented. Sometimes the meaning is a simple concept or type, sometimes it is a typical relation, sometimes a type or concept of value. It is always some type that has developed out of experience to unify experience. It is always added immediately and the entering impression is nothing conscious until it has been added. As the result of interpretation is determined by remote experience, the particular course or sort of interpretation is determined by immediate experience, by the context and the purpose of the thinking at the moment.

If these three forms of judgment can be brought under a single head, it is also possible to show that the judgment as affirmation or belief of Brentano, accepted as the definition of judgment by Baldwin, also, with some reservations, has the same general character, the same warrant and the same occasion. If the ascription of meaning is an expression of ordered experience in its widest relations, belief is another expression of the same experience applied to the same object at the moment of entering consciousness. We believe at the same

THE PSYCHOLOGY OF REASONING

time that we interpret and for the same reasons, because experience as a whole is guiding the interpretation. The only question is as to which of the two outcomes of the process are to be regarded as more important, the content or the belief that attaches to the content. Personally, I am inclined to prefer the content and to define judgment as the ascription of meaning to the presented, or as the reception of the entering impression into the organized consciousness.

CHAPTER V

JUDGMENT AND LANGUAGE

It has been possible to combine in a single definition the uses of judgment prevalent in popular language and that generally accepted by modern logic. But the definition of formal logic that has been accepted for so many ages certainly will not fall readily into the same class. For formal logic, the judgment was always made up of two elements that were combined into a single somewhat in the act of judging. Two concepts, two things, were in some way related. It did not deal with a single concept or a single act. The modern logician has attempted to apply his definition to the process designated judgment by the scholastic, by assuming that the subject represented the given before it was appreciated; the predicate the meaning that was attached to it, the type to which it was referred. But we have seen that the bare given is not in consciousness, that to become conscious the meaning must be attached.

THE PSYCHOLOGY OF REASONING

Evidently this simple device will not serve to make the definition of the modern logician applicable to the process designated judgment by formal logic.

As a preliminary to harmonizing the definitions, we must see that the problem of the logician and his method of attacking the problem are both essentially different from our own. We have been considering the actual mental operation, the logician considers the result as it is expressed in language. This, too, he treats altogether apart from its context. He considers not what the speaker actually did mean by his statement in the connection in which it was given, but what the sentence might mean as it stands out of its context. Each of these different points of view gives different methods of approaching the problem, of determining how the judgment as ascription of meaning is related to the judgment as combination of subject and predicate. The first problem would be, "What is the psychological relation between what is denoted by the subject and by the predicate?" The second is, "How is that judgment expressed in language?"

To attack the first problem we must put ourselves at the point of view of the logician and

JUDGMENT AND LANGUAGE

consider the judgment out of its setting as just two words or terms joined by the copula. The question for him was if one has just this statement and nothing else, what can one imagine the copula or the copulation to do for the terms. This is to omit all consideration of the mental operation that gave rise to the connection and to take no account of the purpose that found its fulfillment in the judgment. If we take this point of view and ask how, given a dead judgment made of subject and predicate, the two may be conceived as connected, we find that there are a large number of widely divergent theories. The diversity is in part due to the fact that the different theorists were dealing with different kinds of judgment indiscriminately and that all were brought under one general head while in reality they belonged in a number of different classes. Some one sort of connection which had application to but one alone was assumed to be true for all alike. Some attempted to bring the judgment under the head of a mathematical relation, others to connect it with psychological operations. Differing views of the nature of the concept as well as different psychological theories are reflected in the theories of the judgment, and each

THE PSYCHOLOGY OF REASONING

in consequence tends to be true for the particular phase of the judgment or kind of judgment of which the theorist was thinking, but it will not hold of all judgments or of all aspects of any judgment. Before we can hope to harmonize them or to do justice to the judgment as expressed in words we must distinguish the different classes and discuss each separately.

Some of the oldest and simplest may be grouped together in the statement that the judgment asserted some relation between subject and predicate. The most familiar of these is the statement of the mathematical logicians that the "is" is a sign of equality. Similarity or partial identity might be brought under the same head. Such judgments as "A" is equal to "B," or "A" is similar to "B" would then be typical of all predication. These are most closely related to the psychological judgment with which we have been dealing up to this point. In fact we might agree that they are phases of the judgment of comparison that were discussed in the last chapter. The only objection that we could make to the ordinary treatment is that psychologically the judgment of comparison is one operation, not two, or at the very least the process of predication is not

JUDGMENT AND LANGUAGE

properly represented by the division of the total as expressed in words. Psychologically when processes are compared the two objects form a unit and the relation is added to them. In the attitude of the moment the distinction between the two terms is not actually recognized and they fuse for the purpose in hand into a single whole. The translation into language that would most accurately represent the mental operation would be "A" and "B" are equal or similar or identical. That the judgment as ordinarily expressed makes "A" the subject, "B" the predicate is due to the vagaries of language not to the nature of the mental operation. As we have pointed out, it is more than likely that the two elements compared are not in consciousness as distinct objects before or even after the comparison, but that they first come to consciousness as "A" and "B" equal. When one looks with that question in mind, the appreciation is of the equality, as a single mental content rather than a series of mental processes, first "A," then "B," then their equality. All judgments of relation in space and time, like all comparisons in whatever respect, fall under this same classification, as has been pointed out in detail, and I hope

THE PSYCHOLOGY OF REASONING

made clear, in the earlier connection. The duplicity in this whole group of judgments is linguistic only; the mental operation is single. The mental operation is one of the types of judgment that has already found a place in the psychological discussion.

Not only is the psychological operation in ascribing equality to two objects not what language represents it to be, but not all forms of predication can be brought under this head. When we assert in the judgment of perception that "a tree is green," or in a general judgment that "man is mortal," we very evidently have no intention of asserting that the tree is equivalent to greenness or that the two are similar or even that man and mortality are in part identical. The same holds of the judgments of naming, "that is a tree," and of a great many other sorts of predication. Evidently other classifications must be considered before we can dispose of these various judgments.

A second definition of judgment would be more appropriate here. This is the group that makes the subject and predicate each a concept and endeavors to interrelate the concepts in some more or less arbitrary fashion. Here falls the relation of subsumption of Euler, the

JUDGMENT AND LANGUAGE

relation of substance and attribute, with the related if not identical theories that the judgment is a process of classification of some sort or other. This entire group assumes two relations that are not in harmony with the psychological operation. In the first place most actual thinking has reference not to all the meanings of the concept, but to a restricted few. The concept as Euler uses the term is the sum of all the meanings that might attach to the term or object, includes all of the ways in which it could be appreciated. When we use the term, we think of but one or a very few of the aspects of the thing, the others are for the moment as if non-existent. Iron in the sense it is used by Euler is the sum of its physical, chemical and physiological qualities. It is magnetic, has a certain resistance to the electric current, has a certain weight, color, chemical affinities, atomic weight, and indefinite other properties or attributes. Every interpretation or appreciation of iron that had ever been made might be regarded as an attribute or quality of the iron. Another concept might be treated in the same way. Metal would have a smaller number of ways in which it might be appreciated, but more objects might be appreciated in

THE PSYCHOLOGY OF REASONING

that way. The process of judging would consist, then, in asserting that all of the attributes that attach to the more general attach also to the less general, or that all objects that could be put into a more particular class could also be brought under a concept with fewer attributes. A concept in this use is the sum of the meanings that could be attached. Where the concept is regarded as an object it would be the sum of all the judgments, in our sense, that might be made concerning it. While conceivably this might be accepted, it is none the less true that but few of these separate meanings play any part in the actual judgment. When considering iron for any practical purpose one is concerned only with relevant qualities of the iron. When making a magnet only the magnetic properties need be considered, not the fact that it may have some therapeutic qualities, or even that it has a certain chemical valence. In practice one is never concerned with all the attributes that the logician ascribes to iron. Even when the object of the moment is to give a scientific classification, no account can be taken in any one system of all the properties. The physicist would classify in one way, the chemist in another, the pharmacologist

in a third way. The group into which a substance falls or at least its place in the group, depends upon the purpose of the classification and the context at the moment. The statement that predication is a process of subsumption in which all the attributes must be considered, and all are of equal value, would be true only when the purpose of judging were to classify the object, and then would be true only with limitations. Even the process of classification involves prejudice of one kind and another. No single classification can arrange in an orderly way all of the qualities of any object, even if the purpose be merely to classify. A systematic Zoölogy, for example, can arrange animals only with reference to an orderly classification of structural features. It must omit functions so far as function and structure do not run parallel, it must certainly omit classification according to edibility and many other practical aspects with reference to which the popular mind would be much more ready to arrange them. Again, then, we have in the judgment of subsumption, or ascription of attributes, a form of the judgment that represents one class of judgments, the judgments of classification, fairly well, but which will not apply to judg-

THE PSYCHOLOGY OF REASONING

ments of relation or to the judgment of perception. Even the judgments of classification are never made in the impartial way that the definition in question implies, but are always colored by the immediate purpose of the man who is classifying. They mean at once more and less.

Brentano and his school interpret the spoken form to assert mere existence or belief. "The tree is green" is translated by them into "the green tree is,"—it asserts belief in the existence of the green tree. While there can be no doubt that belief in the existence of the objects is involved in the judgment process, there can also be no doubt that much more than that is involved, that the belief is merely incidental to the assertion in question, as it is to the appreciation or interpretation of anything. Again we have a definition that makes a single aspect of the judging process take the place of the entire process. Many of the psychological definitions of judgment are open to the same criticism. So Sigwart would have us believe that the process of predication refers the newly entering idea, the subject, to an old idea, the predicate. This may occasionally happen, but is certainly not the universal process. Even in

JUDGMENT AND LANGUAGE

the judgment of recognition or the process of recognition psychologists are at present agreed that there is no necessary reference to a single idea. Even if one were to interpret Sigwart's old idea as our type or concept, it would be highly doubtful whether the subject of the judgment stood for the new idea, or if the unREFERRED somewhat were in consciousness at all, as has been shown in connection with the definition of Bradley and other modern logicians. The definition of Sigwart is a psychological definition that does not do justice to the mental operations actually involved.

Whether the judging operation is a process of analysis, as Wundt would have us believe, or is a process of synthesis as most of the other definitions assert or imply, seems to depend again upon the presuppositions as to what is present in consciousness before the judging begins. If we regard the object as a mass of elements standing in consciousness before judgment has operated at all, then it is possible to say that as we attend to the mass we pick out one aspect that constitutes the subject and then another element that constitutes the predicate and that they are held together by the fact that both were found together in the original un-

THE PSYCHOLOGY OF REASONING

analyzed mass. The judgment process is certainly analytic. If we assume that the two elements were present in consciousness as distinct elements before the judging process and that they are combined only in the judging operation, then judgment is synthetic. The great difficulty with either view is that the elements cannot be shown to be present in the unanalyzed state before the operation of judging. The mass is assumed only to explain the final outcome. When we look at it as a mass it is not present at all or it is not present with the qualities that come out of it in the process of judging. These latter we know only when we judge it in the one particular way. At other times it is always something else even if we do call it by the same name at all times. On the other hand, the two elements of the synthetic judgment are not present in consciousness before they are connected. The operation of connecting and of generating the elements is a single one. When the process is completed, we have two elements united; we do not have first one then the other, then the union. Neither the statement of synthesis or of analysis is quite properly made. Of the processes that are usually called judgment, some fall more nearly

JUDGMENT AND LANGUAGE

under the head of synthesis, others more nearly under the head of analysis, but the classification with reference to the distinction can be left over for the sake of convenience until we have given further discussion of the judgment from the descriptive point of view.

It is evident from the theories of judgment that there are a number of different operations currently designated as judgment, and that, when the definitions apply to the same general process, different phases of the process are emphasized to the exclusion of others that might equally well be regarded as essential. Each of these operations and phases must be kept distinct, and the definite presuppositions that lie at the basis of the definitions must be distinguished before we can hope to find the kernel of agreement or sharply oppose the disagreement between the theories. In the first place we must distinguish definitions that apply to language and the completed operation, from those that apply to the mental operation and the judgment in its genesis and origin. Much that is involved in the production of the judgment does not find expression in words at all, and if we regard the judgment as isolated from its context there is often no indication of many

THE PSYCHOLOGY OF REASONING

of the circumstances that are vital to the operation as a mental process. On the other hand, the translation of the mental operation into words may not be complete. In fact, we shall see that there is no necessary one to one relation between the judgment as a mental operation and the resulting expression. Elements that are important for thought are omitted in expression, and factors that are made prominent in expression may be the result of convention rather than of the thought process. If we are to make much headway in the process of ordering the judgment forms we must turn to study the judgment in the making and see how the simple apprehension processes are translated into language.

The first problem in this connection is to see how the different kinds of judgment in the earlier descriptions are actually translated into language. To study the dead product when one has access to the operation of producing is very much the same as to spend time speculating what purpose a gear found in the road may have when one can go a little farther and see in actual operation the machine from which it fell. If one studies the judgment as the dead result, the conclusions are very much like the

JUDGMENT AND LANGUAGE

results of the seven blind men of the story book who studied the elephant. Each is an interpretation of a part, but no understanding of the whole can be obtained until the parts are considered together.

If we begin with the judgment of perception as is customary at present with logicians as well as with psychologists, our first problem is how our appreciation of an object or situation is expressed in language. The most immediate translation and the one that perhaps best expresses it is the interjection, the cry of "wolf!" or "fire!" when the animal or object is recognized. The single cry arouses in the mind of the hearer the same appreciation that it does in the mind of the observer and speaker, and if the context is the same there is the same awareness of the exigencies of the situation. It prepares for the same set of activities. There is but a single mental operation in the interpretation, there is similarly but a single word in the judgment. All else that is necessary to an understanding is supplied by the context, by the hearer's knowledge of the situation. This is the type of the linguistic judgment. The second stage in the advancing complexity of expression is the impersonal judgment, "It's

THE PSYCHOLOGY OF REASONING

raining," or in the same situation as above, "It's a wolf." What to do with the "it" has long been a bone of contention between logicians and grammarians. It has been often conjectured that "it" stood for nature, for the deity and similar hypotheses. These are evidently not satisfactory, or they would not vary so greatly. Marty, a disciple of Brentano, is much nearer the mark when he asserts that only one process is involved in the impersonal judgment and that is the appreciation or perception of the presence of the animal or the rain plus the assertion of its existence. Both of these factors are undoubtedly involved, but as has been insisted so often there is probably no express assertion of belief in the truth of the perception. That is taken for granted here as everywhere. What is of importance is the character of the object and the fact that it is present rather than that it is merely existent. In brief, the impersonal judgment involves nothing more than the interjectional. It expresses the appreciation of the object or the quality that presents itself and nothing more. One might ask why then the "it" and the copula? The answer is that the linguistic convention of subject and predicate has become so

JUDGMENT AND LANGUAGE

thoroughly established that any other expression seems awkward. Nothing is meant by the "it." Nothing in mind corresponds to it. Its presence is due to a mere habit of language.

If the same kind of appreciation is present in both the interjectional and the impersonal judgment, the question might easily arise why is it that one form is employed at one time and the other at another. The answer to this question is to be found, not in the mental operation itself, but in a second set of controls that are at work in expression. This is the appreciation of the social situation, of the men about and their attitude toward the speaker, their distance from him and other similar factors. If the men are near and the general situation is appreciated, the impersonal form of judgment is the more likely to be used. If the speaker is remote from the others and the danger is great and immediate, he will employ the interjectional form. For some reason hidden in the obscurity of the development of language, the interjection is the form of emotion and of long distance communication. Undoubtedly the reason is to be found in part in the practical efficiency of the one word as a cry. It requires less time to complete and is more easily

THE PSYCHOLOGY OF REASONING

shouted, will carry farther than the longer form. If walking with a companion, and the character of some object has been under discussion, the first man to identify it would say, "There's a wolf," or "It's a wolf." If he is alone or, if coupled with the determination is the appreciation that flocks are in danger and can be saved by immediate action on the part of men at a distance, the impersonal expression would give place to the cry. This appreciation of the social circumstances and needs exerts the same sort of directing influence upon the expression that the mental context does upon the selection of the object to be appreciated and the way it shall be appreciated or interpreted. The social factor plays an important part in the determination of the form of expression and consequently we shall find it necessary to consider it throughout in connection with the spoken judgments.

The next stage in the complexity of the judgment as a linguistic unit is the so-called demonstrative judgment. In the demonstrative judgment an indication of the place of an object is added to mere appreciation. In the instance above if the position of the wolf were a matter of importance and were not sufficiently well

JUDGMENT AND LANGUAGE

known from the context, the probability is that some demonstrative might be used, "That is a wolf," or "There is a wolf," or some similar form. This part of the communication might easily be supplied by a gesture or by the direction of the glance. In fact were there not some such gesture, or if common direction of gaze could not be assumed on the basis of earlier conversation, the "that" or "this" or "there" would have no meaning in itself sufficiently definite to be helpful. In considering this type of judgment we must be on our guard on the one hand against taking the demonstrative too seriously, and on the other of neglecting the essentially spatial appreciation that may be involved in the simpler forms of judgment already discussed. In many cases the demonstrative is prefixed as the result of linguistic convention, as was the "it" of the impersonal. "There" has become a conventional word to introduce a sentence when no reference to space is intended, but one desires to avoid repetition of the usual subject-predicate order. "That" and "this" are often employed in conversation in very much the same way. In such a case nothing beyond simple apprehension would be involved in the judging process as a mental operation.

THE PSYCHOLOGY OF REASONING

But on the other hand, neither of the earlier discussed forms of judgment would be of great practical importance unless this spatial appreciation were involved in them to some degree even if only implicitly. Apprehension as preliminary to action would be valueless without appreciation of spatial position. Similarly valueless would be the expression that we have in the demonstrative judgment, unless supplemented by gesture or direction of glance. The judgment of one kind is on the same level as the other in making evident the space relation. The demonstrative is as helpless as the impersonal judgment in assigning position to the object appreciated. Both must either assume a knowledge of position on the part of the listener, or must trust for the indication of the object presented to the attitude of the speaker revealed in some other way than through words. The demonstrative in this case is either a convention of language, due to some vague consciousness of the importance of the position as apart from the quality or the general character of the object, or a suggestion to the hearer that he look to see where the speaker is pointing or looking.

Other forms of the demonstrative judgment

JUDGMENT AND LANGUAGE

carry us a step farther toward what one regards as the typical judgment, the simple perceptive judgment, or the simple categorical judgment that has two distinct parts. This comes when one uses the "that" to indicate a direction and the direction is itself the essence of the process. Such, for example, are the expressions "That is east," "This is west," or when two objects are important because of their position rather than because of their quality. We must grant that in this case there are two appreciations of the object, one with reference to its character, the other with reference to its position and that each is or may be equally important. Discussion of demonstratives of this kind can be postponed to advantage to a later connection. They evidently do not belong among those that may be brought under the definition of judgment that has been given as the appreciation of a single object. The first form of the demonstrative belongs with the interjectional and impersonal judgment. All three can be considered as the linguistic counterparts of the psychological judgment as we have defined it. Each has but a single term although that term may be expressed in more than one word.

As we approach the typical judgment of

THE PSYCHOLOGY OF REASONING

formal logic, in which subject and predicate each represents an object, quality or activity, it is by no means so easy to bring the operation under our definition. When, for example, one asserts of an object in the field of view that "that tree is green" there is not one act of apprehension but two. Two meanings are apparently added, the single object is given two different interpretations. This, to be sure, is not always the case. Often the subject is not important at the moment of speaking, but is spoken almost unthinkingly, or is supplied on the basis of an earlier interpretation. But in many cases it must be admitted that the subject is as much the result of a distinct act of judgment, in the terms of the last chapter, as is the predicate. The two possible definitions of the judgment process that are current represent actual differences in the importance of the subject. On the one side it is occasionally, perhaps often, but slightly emphasized. This corresponds to the definition of Bradley and the Dewey school that the subject is the mere given to which the predicate is attached to give it meaning. Existence as a tree with its qualities is taken for granted, or even is introduced to satisfy the language convention. But on the other hand there can be

JUDGMENT AND LANGUAGE

little doubt that the subject in many cases represents just as complete an interpretation of the entering impression as does the predicate. These cases justify the traditional usage of making subject and predicate on the same level of importance, whatever we may think of the traditional method of disposing of the connection itself. All degrees of importance between these two extremes attach to the subject. In deciding this question we can not come to any safe conclusion if we take the judgment apart from its setting, and we can best illustrate and prepare for our conclusions on the basis of hypothetical situations in which the judgments might be passed.

It is inconceivable that the judgment "The tree is green" should be spoken unless there were some definite occasion for it. This occasion might be supplied by the presence of a companion, having in common with the speaker a purpose that might be satisfied by the discovery of a tree still in leaf. The purpose of the expedition may be to discover decorations for some festal occasion at a season when foliage is scarce. Under these conditions when a tree, still in leaf, presents itself, the remark is the natural one. In any such situation the exact

THE PSYCHOLOGY OF REASONING

words spoken are not to be taken too literally. Numerous other remarks might satisfy the same end. "That will do," "There" or even a gesture suffice to attract the attention of the hearer and inform him of the end of the quest, provided only he completely understands the situation and shares the purpose. If he does not, the words of the sentence are entirely inadequate. Under such circumstances the predicate alone is essential, the subject "the tree" is supplied by the earlier conversation. It would not be at all important at the moment and we might regard the actual judgment as nothing more than an intimation that here was the green that they had been looking for. The subject would be a remnant of a judgment process that had been completed before. A situation of this kind satisfies fairly well the conditions of the Bradley definition that judgment is merely the ascription of meaning to the given. It satisfies it, that is, so far as one does not accept what they seem to, that the subject is present as a meaningless somewhat, held in abeyance but still conscious. On the contrary it has been already appreciated as something else, but that appreciation is taken for granted at the moment the judgment is passed. Consciousness is filled by

JUDGMENT AND LANGUAGE

the fact that the given is green—that it is a tree is entirely subordinate. This sort of implicit acceptance of the subject on the basis of earlier appreciation is very common. If we consider merely the operation, not the word form, we have but a single ascription of meaning, not two. The subject however represents not something that is meaningless but something to which a meaning of another kind has been ascribed a moment before and which is not prominently before consciousness at the instant.

On the other hand there are many cases in which subject and predicate are equally important and each represents a distinct appreciation of the object. Such is the case when several small green objects have been examined and do not furnish a sufficient amount of foliage to make it worth while to carry them off. One might then make the remark "*that tree* is green," in which the appreciation of the object as a tree is equally important with the appreciation of the fact that it still retained its foliage. It would be the equivalent of "That is a tree" and "It is green." Two meanings would be ascribed in succession and each would be as important as the other. It would be a process on the same level as attachment of

THE PSYCHOLOGY OF REASONING

successive predicates, as if one should say that ice is soft and dirty. In these cases there can be no doubt that the proposition involves two judgments in terms of the definition that we have given in the preceding chapter. One is compelled in cases such as these to give up all attempts to bring the definition into harmony with the traditional significance of the term.

While then we can bring under the definition that is common in popular speech and modern logic all judgments of relation, and of spatial attributes, all impersonal and interjectional judgments, most demonstrative judgments and a fair proportion of the simple judgments of perception, a small residue of the simple perceptive judgments remains in which it must be admitted that the thought as well as the form shows evidence of the presence of two terms. If we are compelled to assume that some of the relatively simple judgment forms of the logicians give what we have called two judgments rather than one, two questions at once arise,—first, what shall we call the process, and second and more important, what is the connection between the two judgments or terms, what is it that holds them together? The first question we shall leave open until we have occasion to

JUDGMENT AND LANGUAGE

compare the more complex propositions with the simpler forms of inference. Certainly inference and this form of the logician's judgment shade into one another. But before we make the assertion that all connections between two judgments as processes of interpretation are to be called inference, we must raise the second of our two questions,—what is the relation between the two interpretations, what holds them together?

If we confine ourselves for the moment to the judgment of perception, we see first of all that any relation depending upon the irreversibility of the terms must be rejected. Under this head come all the theories that assert that the predicate is essentially different in form or in its effect from the subject. This can be very easily shown from the fact that in most instances subject and predicate can be interchanged and the judgment still remain a judgment. In our simple instance one can quite readily conceive that a man might say "That green is a tree" and have it mean as much as "That tree is green." It depends upon what his purpose in the search might be and the order of appreciation of the different qualities. If he wanted a tree for any purpose and one green object met his eye, he

THE PSYCHOLOGY OF REASONING

would point it out to a companion with tree as the predicate just as certainly as where trees were plentiful and foliage were scarce he would make green the predicate. This inversion of subject and predicate is applicable to all judgments of perception except possibly those that have their end in the process of naming. Which is subject, which predicate, depends altogether upon the purpose of the man at the moment and upon the circumstances under which he is speaking. This fact excludes all definitions like Sigwart's that make the subject always a new impression, the predicate, the old idea to which it was referred. It also excludes all of the various kinds of subsumption. Even the judgment of naming is not altogether excluded from the test nor from the more general statement that the subject and predicate are more or less independent interpretations. The object may be named either in the more general or in the more particular way first. In either case one is subsuming the presented *quale* under two heads, that may be regarded as independent or that may stand to one another in some definite relation of generality. There is no reason why the predicate should be universally less general or more general. And while in practice it is

JUDGMENT AND LANGUAGE

probable that the more general term is most frequently made the predicate, that is by no means universal.

If the subject-predicate order is not dependent upon the importance of the appreciation or upon its degree of generality, it would seem that even in the cases where each of the two terms stands for an independent appreciation the subject and predicate can not be distinguished in any easy way. No positive and universal assertion can be made as to the particular function of one or the other nor that any particular operation is performed upon them by the juxtaposition. So far as can be made out they are in themselves entirely independent operations. Why, then, are they juxtaposed? Two suggestions might be made. One is essentially realistic,—that they are held together by the unity of the object, that each is a different interpretation of the same object and that all of the interpretations of that object are likely to be joined in a single proposition. While this is not the place for a discussion of realism it may be urged as a difficulty that there is doubt whether the object has these qualities before they are appreciated, and hence whether it can be said to exist as a unity in advance of the

THE PSYCHOLOGY OF REASONING

interpretations that are put upon it. One might insist that the qualities had been appreciated together before and now come back together because of that fact. This would reduce the reason for their successive presence to habit or to association rather than to the unitary nature of the object.

Even more important probably is the explanation in terms of the unity of the purposes that the two interpretations further. If the problems that serve to develop the interpretations are connected, the interpretations will succeed one another. All the other possible interpretations that are not essential at the moment will be in abeyance, will not make their appearance. In other words, if we consider the judgment in isolation from the universe of discourse in which it is found, we can not understand the relation of subject and predicate. These two appreciations are held together by the general purpose that dominates consciousness over that whole period. It is also what controls the movement of thought for the same time. One can not understand the reason for the succession from an examination of the single pair because there is nothing in the single pair that decides that they shall be connected. What decides the

JUDGMENT AND LANGUAGE

order that the two appreciations shall take is the general situation of the moment. That also decides that they shall be connected and the nature of the connection. The single proposition is but a part of a total larger movement of thought, and it is this larger movement of thought that gives it order, that gives it what connection it has. Without it the judgment is a pair of disconnected appreciations. Again we may assert that the nature of the relation varies according to the whole of which it is a part, according to the purpose that is to be fulfilled at the moment. So at one moment the judgment is merely the process of connecting an object appreciated in one way with a wider class of appreciations, a process of classification or naming. At another moment it is a process of expressing an appreciated equality or identity; at still another it is the expression of a series of disconnected appreciations, or of appreciations that are connected only because they all serve to advance the purpose of the moment whatever that may be.

In short, the judgment is but a link in a connected chain of thought and it is impossible to understand it apart from the chain. We are within the truth if we assert that no judgment

THE PSYCHOLOGY OF REASONING

of perception can be understood in its real meaning unless taken in its context. The reason for the expression both in form and in content can be understood only from the context. We have seen throughout that the same mental operation may lead to one of several expressions according to the social situation, the distance of auditors, their preparedness, etc. Similarly we can understand the connection of the elements in the mind of the speaker, only if we consider the entire situation from which it arises, the entire movement of thought in which it developed. Each of the theories that were examined is inadequate in part because it has not asked what the connection between the parts of the judgment is in the actual setting in which it arises. Instead, they all ask what the connection might have been in any situation. To this no single answer can be returned. It might be any one of the forms of connection suggested, it may be none of them, but depend upon some chance succession of words. All of this leads to the one result that the nature of predication can not be defined in a single statement. Predication may assert any one of several connections. One can say which one is intended in any particular case only by a study of the actual pur-

JUDGMENT AND LANGUAGE

pose at the moment of judging. This may be known at first hand or from the context.

An attempt to summarize our results so far as concerns the subsuming of the judgment of perception under the definition that we found to correlate the judgments as described by the psychologist, results in the statement that the mental operation behind the interjectional and impersonal judgments, and behind many of the demonstrative and simple two-term categorical judgments, is evidently the correlate of the ascription of a single meaning to the presented somewhat. Of the other two-term judgments we can be sure that there are two interpretations, that two judgments are involved. How these two interpretations are connected can not be determined from the proposition itself. The connection is controlled by the wider context of thought and varies between mere succession of appreciations, through the classification of bare naming, to the real classification of subsumption. A very large proportion of the processes that the formal logician calls judgment fall under our definition of the last chapter, and are really one-term processes that are either expressed in one word only, or in two words. Where two words are employed, as in

THE PSYCHOLOGY OF REASONING

the judgments of relation and many of the categorical judgments, the subject does not correspond to a vital mental operation at the moment, but is added to comply with linguistic convention. Since the judgment process of formal logic is psychologically not a single process, but represents a large number of diverse operations which can not be brought under a single statement, and since the connection can not be stated in terms of the single proposition alone but must be regarded in terms of the whole movement of thought, there seems to be no reason why we should not define judgment in the popular way, and in harmony with the definition of Bradley and Bosanquet. Those forms of the judgment of the formal logician that will not come under this head, we may either call propositions, or we may push them on to the next more complicated operation, inference.

This somewhat radical change in nomenclature may seem the more justifiable if one considers the undue proportion of reasoning that recent logical theory has brought under the head of judgment, and the little that is left to the more practical operation of inference. Superficially regarded this seems to indicate that the recent writers have failed to find any sharp line

JUDGMENT AND LANGUAGE

of distinction between what they call judgment and what they call inference and have been crowding more and more into the judgment until at present there is on their designation nothing, or very little, left over for the inference. The present scheme leaves three forms over to inference: the judgment of perception in which two interpretations are given of the presentation; those cases in which the first interpretation suggests an older impression, a memory; and the whole series of propositions in which both terms are supplied by memory. How far it may be possible to bring these all under one head is one of the problems for the remaining discussion.

CHAPTER VI

INFERENCE

We approach the problem of inference with a considerable portion of what is ordinarily designated judgment still to dispose of. It has become evident from the two preceding chapters that a large proportion of the propositions that the logician calls judgment are judgments in our sense,—are simple interpretations of the presented. But we have left over three sorts of judgment with distinct subject and predicate, those in which there are two interpretations of the given. These include (1) those in which there are two interpretations of the given, (2) those that add to the presented some quality that it is remembered to have had at an earlier presentation, (3) instances in which we imagine that the object has been changed in some way or see how it could be changed to advantage. The first of these processes is called the analytic judgment in the spirit of the current logical usage; the second, the synthetic judg-

INFERENCE

ment; the third is universally accepted as a process of inference. Our first problem in this chapter is to trace the distinctions and similarities between these three processes to determine whether they can be brought under a single head.

In beginning the investigation we may at once take advantage of the lesson learned in the discussion of the judgment, and recognize the fact that there is no necessary relation between the form of expression in language, and the actual mental operation. We shall, in consequence, begin at once with specific thought processes to determine how far they are similar, how far dissimilar in the three cases. Perhaps one instance will do as well as another. "That tree is green," which has already been discussed in another connection, may suffice in spite of its triviality. Here certainly is an analytic judgment of perception. Both the greenness and the tree may be said to be analyzed from the immediately perceived. Probably too there is little or no subordination of one to the other. At least, as was demonstrated in an earlier discussion, either may be regarded as subordinate to the other according to the circumstances under which the assertion is made. And, were

THE PSYCHOLOGY OF REASONING

there any occasion for the addition, we might continue to add similar attributes as evergreen, tall, and the like, that would still further define the object. The simplest of the synthetic judgments differs from this only slightly. Such, for example, "The tree would supply tough wood." Here the quality is not regarded as necessarily contained in the object, but is added to the object of presentation on the basis of earlier knowledge. Toughness is no immediate quality of sensation and cannot be seen directly, but similar bits of wood or parts of similarly green trees have, when tested in the past, been found to be tough. What is seen is some roughness of bark, or color or shape of leaf and these serve to reinstate the toughness as a general idea, to recall a definite earlier experience.

Again the process of addition may go farther. The actual connection may never have been in experience before, and the added element may be some improvement or change in the object. Instead of actually recalling the use of the twig that proved it to be tough, there may be suggested the idea of grafting on the tree a twig of hickory that shall grow numerous tough twigs, or some way of preparing the wood may suggest itself that shall give to what was naturally brit-

INFERENCE

tle wood some degree of resiliency. In this case, too, there is nothing more than the addition of old experiences to the new that will modify it in some degree or other. The earlier experience has not been definitely connected with this particular object or perhaps with any object of a similar kind. Certainly to the first man who grafted a tree, if it were done intentionally, there had never been any close connection between the thought from which the action grew and any similar act. And each time the process is repeated on a new plant or animal, processes are connected that have not previously been connected in any way closer than to recognize the likeness of the two species and the probable similar response of objects, alike in some characteristic essential for the experiment in question. An instance of this kind is universally called inference.

The specific instances show a number of close similarities. Each consists in the primary recognition of some phase either directly seen or supplied from memory. In fact if we look more closely into the psychological mechanism, it becomes a question whether it is not more difficult to distinguish one from the other than it is to find points of resemblance. True, in the

THE PSYCHOLOGY OF REASONING

first instance, it seems that there could be no difficulty in deciding whether the second quality were actually given in sensation or were added from memory. In the assertion "the tree is green" there might be little or no doubt that the color appreciated is an immediate sense quality, but when we go a step farther to the form, or to the size, or even to the simple process of naming, it becomes a question whether one could say that the judgment were analytic or synthetic. The more apparently simple perceptual qualities are analyzed, the more complex they are found to be, the more they are seen to depend upon the addition of elements from memory rather than upon the mere entrance of a quality actually present in the object or given. It would be very difficult to say in the light of recent investigations in space perception, whether the recognition of toughness in the twigs of a tree were more the result of memory processes than the recognition of the size of the twig, or of its direction, or than the discrimination between the actual color of the object and the apparent color due to the contrast and shadow effects. Each of these characteristics comes to consciousness immediately; there is no more awareness of the mental operation

INFERENCE

that results in the interpretation than there is of what takes place before the entrance of the green in the simplest instance of sensation or perception. It is only elaborate and long continued psychological analysis that has led to the recognition of the fact that in these space perceptions we are dealing with interpretation and not with immediate sensation. Without raising the question whether there is not a possibility that one day the simplest processes may be analyzed into still simpler parts, it is impossible to decide exactly where to draw the line between the cases where subject and predicate are both given in immediate sensation and where one is added from memory. All would agree that recognition of the size of an object is due to factors immediately given in perception and sensation, but it would be very difficult to decide on any psychological grounds between that and let us say determination of the probable size of an animal from its footprints in the snow.

The two forms of judgment are alike not merely in the materials of which they are composed but in the way the second is selected from the number of qualities, phases or memories that might come to consciousness at that

THE PSYCHOLOGY OF REASONING

particular time. Whether one phase or another shall appear depends upon the interest, upon the dominant problem, upon the controlling purpose at the moment. As we said before, you will notice the greenness of the tree only when you are looking for foliage with which to decorate a room, or for shade, or as forage for cattle, or what not. Were the mental situation or context to change, there would be similar change in the quality or phase that is seen. In exactly the same way in the more synthetic judgment, what shall be added from memory to the first impression depends altogether upon the setting, mental and physical. The tree will suggest toughness of wood only if it is desired to obtain wood for some definite purpose. And so for the intermediate forms of judgment. One sees the size of the object, or its distance only if one or the other is important. In short, the succession of phases that shall present themselves in the bare sensing, the characteristics that shall be added in perception or in the synthetic judgment, depend upon the same general set of conditions, upon the mental context at the moment.

The difference between inference in its simpler forms and the synthetic judgment is fully

INFERENCE

as fleeting as is the difference between the analytic and synthetic judgment. There is no question here that the materials are identical. In both, what is added is a memory process. The only possible distinction that can be made is in terms of the relative newness of the addition, in the frequency with which the same two elements have been found together, and where one was new, the degree of divergence between what is added now and what had been seen before. There would, for example, be no question that we were dealing with judgment alone, or at least had nothing to do with inference in the ordinary sense of the term in case we were merely passing some remark upon the size of an object, or more simply upon the relative size of two objects. If it were a question of deciding whether a track in the snow were of a rabbit or a squirrel there would be more difference of opinion. Whether it were made a problem of perception or of inference would probably depend in last analysis upon the method by which the conclusion was reached. If the man who decided were perfectly familiar with the two animals and the footprints so that but a glance were necessary to decide, it would be called judgment, or mere perception if we

THE PSYCHOLOGY OF REASONING

keep to the psychological ground. If the onlooker were more skilled in theoretical or book science than in woodcraft, the conclusion might be reached slowly and more self-consciously. There might be successive trials of the fact under different heads, and a gradual elimination of the impossible or unlikely conclusions. This would be inference. Between these two extremes would lie a host of cases gradually shading from one to the other. For some the interpretative addition would be immediate, for others long deliberation would be required. Certainly no one point in the scale of immediateness or explicit consciousness of the processes would be accepted by all as marking the line between inference and what is not inference.

One might be tempted to make the line of division again on the basis of the newness of the addition. If the interpretation consisted in the addition of an element that had been frequently noticed in connection with the thing perceived, we would certainly have to do with synthetic judgment. If on the other hand the two had been but infrequently connected, the process would be called inference. This is an uncertain criterion, partly because there are all degrees

INFERENCE

of frequency as there are of complexity, partly because there are cases that would certainly come under the head of judgment that had been connected but once before, such as learning the name of an object by one repetition. On the other hand some would still rank as inference in spite of the fact that they had been repeated several times, and the process of inference might be run through with little or no difficulty. Again the degree of similarity between the present set of circumstances and the earlier that served to suggest the change might be used as a criterion. This is open to the same objections. The presented can never be identical with any previous experience. It must be interpreted, and whether the interpretation that one makes is fairly new or is the result of mere habit depends upon the man and upon the circumstances under which he is working. There is no objective measure of the difference at the extremes and no satisfactory line of division at all. To the first man who succeeded in thinking of the possibility of grafting parts of the body of one animal upon another, there was presented the idea of the similarity between plant and animal tissues. Whether plant and animal were for this man more similar than

THE PSYCHOLOGY OF REASONING

were the rose and apple to the first gardener who grafted the rose, would be a question that could be answered only by a definite knowledge of the mental make-up of the two men and the conditions under which each worked. It is, however, not at all impossible that the gardener's processes at the time were defined as a mere synthetic judgment, as bare association induced by failure to recognize the difference between the two kinds of vegetation, while the scientist's grafting would undoubtedly be classed under inference. Between would run all sorts of gradations. What would be inference for one man in the popular sense certainly would not be for another if we use exactly the same definition of inference in the two cases. Again, to connect this illustration with one that was used earlier, whether the suggestion of grafting is more of an addition to that immediately given than the recognition of the quality of bending or of burning readily, would be a question that reduces ultimately to the frequency of earlier connection.

There is finally no difference in the nature of the control processes that determine the course of the stream of thought, that decide what the particular addition shall be in each case. What

INFERENCE

the addition is to be depends in inference as in perception upon the problem one is trying to solve, upon the end that one has set one's self to attain. When the tree is in consciousness one thinks of grafting if dissatisfied with the product of the tree; one thinks of propping up the limbs and looks for means of supporting them if it is appreciated that the yield is too great for the strength of the limbs. In this regard, too, inference is not to be distinguished from the processes that are ordinarily called judgment. The nature of the control is on exactly the same level.

Apparently then the three processes of analytic judgment, synthetic judgment and inference in logic are not to be easily distinguished. They are alike in the elements of which each is composed, in the nature of the consciousness that accompanies, in the nature of the factors that control their course, and it is even difficult to draw a distinction in terms of the simplicity or complexity of the processes. We seem to have too few distinctions or too many words. At this juncture some change from the usual nomenclature seems necessary. For my own use I propose to adopt explicitly at this point the usage that I have been following without

THE PSYCHOLOGY OF REASONING

any preliminary justification. It is certainly possible to distinguish between the first appreciation and the interpretation that is added to it, or between the first appreciation and the second appreciation that succeeds it. My suggestion is that we call the first of these processes judgment, and the second either inference or a succession of judgments. In this usage we must have reference to the psychological process and not to the expression in words. The necessity for this distinction has, I trust, been made clear. This departure from current usage is not so radical as it may seem at first sight. Many of the more recent writers either by their own avowal or by the logical consequences of their definition have made the judgment a single process. Brentano in his definition of judgment as an expression of belief or disbelief, Külpe and Marbe who define it as comparison, Bradley and Bosanquet, Dewey and others who define it as the addition of meaning to the given, all explicitly or by a necessary result of their conclusions make judgment a unitary process. Here, too, we may mention the fact that Binet finds reasoning in perception and Helmholtz calls perception unconscious inference.

INFERENCE

The discussion of the relation of judgment to inference has followed the psychological and popular usage somewhat more than the logical. The logician always defines inference as made up of judgments, as a process by which two propositions are united in a way to give rise to a third that states a new truth derived from them. The first proposition is the major premise and asserts a general principle, the second or minor premise contains an application of the general truth to the particular set of circumstances, while the third states the conclusion, the new truth. If all of these operations and processes are in consciousness during the inference and determine the character and course of the inference, obviously one cannot describe the process as the mere combination of two mental processes or the succession of two appreciations. But the logician's insistence on the presence of the premises during the actual reasoning has long been questioned. Thomas Brown early in the last century denied that the major premise has any real part in reasoning. Many skeptical individuals have argued that if reasoning did nothing more than recombine propositions it would make no real contributions to knowledge. Careful examina-

THE PSYCHOLOGY OF REASONING

tion of the procedure in a case of concrete reasoning, will, I believe, convince anyone that he is actually aware of nothing but the conclusion.

If it be accepted that inference consists of the conclusion alone, the question why the formal logician gives the premises so large a place in his discussion naturally presents itself. The answer is to be found in the fact that the logician has been for the most part indifferent to the origin of the conclusion, he has been concerned with its truth alone. All of his efforts have been devoted to proving that the conclusion is true, he has given no thought to the mental processes that originated it, he has even denied that it is the product of mental laws. He has never gone behind the words that express the conclusion and he has considered them as they stood in a book not with reference to the mental processes that give rise to them. As a matter of fact, the essential part of thinking is to know that the results attained are correct; how they originate is a question that interests one only as it points out methods that should be avoided. Furthermore, inference and proof are entirely independent of each other. One may prove conclusions attained in any way, even if they originate by chance or are taken from someone else.

INFERENCE

Bad methods may give true results and if one only recognizes the results as true or false when they come, it matters not in practice whether the method be good or bad.

The fallacy of the formal logician was that he devised methods adequate to prove his results and then assumed that the methods of proof were the methods of deriving the results. When the conclusion was once given he found that he might give it added probability by referring it to a general principle already established. This was the major premise. The reference of the conclusion to the general principle was made in the minor premise. If the premises existed as means of establishing the conclusion it was unconsciously assumed that they might also be the facts from which the conclusion developed as well. As the logician was never given to observing mental states, and needed an explanation of the origin of his conclusion he jumped at the chance to solve his problem in the quickest possible way. As was said in the first chapter, the logician was always satisfied to know how results might be obtained, he cared nothing for knowing how they were actually obtained. Our thesis then is that the syllogism arose through confusing inference

THE PSYCHOLOGY OF REASONING

and proof, that it is adequate to proof of one kind but has only remote relation to the derivation of the conclusion. The thesis can be established by a consideration of the different forms of reasoning in the concrete. It will be seen that in actual reasoning the conclusion always precedes the premises where they are present at all, and also that the same influences give rise to the conclusion no matter how it may be proved.

To avoid the many pitfalls that beset one in the discussion it is necessary to distinguish between inference and proof. Conclusions all come through suggestion, and the laws of suggestion here are the laws of association as they are found in memory or imagination or in action. We may distinguish several different sorts of inference or ways of reaching conclusions. First, one has actions that give conclusions of value with little or no antecedent thought. In animals we have little or no evidence of mental processes, but the acts very frequently give results that are similar to the reasoned conclusions of men. Frequently men's acts have a rational outcome when there is no antecedent thought to speak of. The sudden demands of a game are met by movements

INFERENCE

in which thinking and action are practically indistinguishable. Then one may distinguish the cases in which the thinking processes precede the action by a noticeable period or in which the reference to action is remote. These two sorts of inference follow the same general laws and may be treated together. In each may be distinguished inferences in which the correct result is reached at the first trial and others in which many unsuccessful trials precede the attainment of the desired end. This distinction is more evident in action or at least has been given more importance in action. Occasionally to be sure one makes the correct response at once, but more frequently, particularly when the movement is new or is a new combination of movements, one tries several times before the desired end is attained. Similarly in thought one sometimes hits upon the right idea at once, but more frequently numerous suggestions present themselves before one is satisfied with the result. If one is writing, several expressions come up before just the right turn is hit upon and the same is true in the designing of an instrument or the solution of any puzzle. One tries plan after plan in thought before one is satisfied. It is not until

THE PSYCHOLOGY OF REASONING

some suggestion has passed the test that inference is complete.

It might appear from all this that human thinking is altogether like the method of learning that Thorndike and numerous other more recent workers have demonstrated to be fundamental for animal acquirement. That just as the animal keeps struggling in one way or another and needs only a sufficient diversity of movement and sense enough to know when the end is attained, so man needs no more than a large number of suggestions and an adequate test of the results, to accomplish any end whatsoever. On this assumption, if a mathematician were dictating an original treatise to a stenographer ignorant of mathematics, the mistakes of the stenographer would be as fruitful as the thinking of the scholar, provided only they were sufficiently numerous and the mathematician was qualified to select the conclusions that were true. The grain of truth in the idea is the absolute independence of obtaining and testing a conclusion. But it does not follow that the suggestions come without law. They certainly are more likely to come to certain minds than to others. A man trained in mathematics is more likely to have the solution of a problem

INFERENCE

present itself to him as well as more certain to be right in accepting the suggestion when it comes. While, then, the suggestions leave more to chance than does the test, it does not follow that suggestions arise without reference to law. But the laws of suggestion take us once more into psychology.

The laws that govern the appearance of the solution or that give rise to the suggestions or to the movements are the laws of association. In the simple case of movement, the stimulus or the appreciation of the stimulus calls out the response that has been earlier connected with that stimulus. It is a question of habit, nothing more. Where several responses have been made upon the same stimulus as would be necessary if the process is to be classed as reasoning, one response is selected from the others in the light of the connected circumstances, or in terms of the particular mental context. Where all of the important circumstances are considered or are reflected in the response the reasoning is adequate, where some are omitted the trial is unsuccessful and the result is not called reasoning unless it can be said that the trial contributed something to the final result or one speaks of the process as a whole. The success-

THE PSYCHOLOGY OF REASONING

ful trials then are guided not merely by the immediate cue but by the purpose of the individual and by many other elements of the environment, present and immediately past. The larger the number of relevant circumstances that are effective in the control, the greater the probability that the act will be adequate.

One may distinguish the same laws in the operation of thinking with reference to a later act. Here again some cue must be present such as the appreciation of the situation actually present or imagined. This suggests some operation that has been earlier in connection with the situation. Since ordinarily many suggestions might come up and only one actually does appear some criterion of selection must be found, and is furnished by the wider context of the moment and the situation in which the whole problem is appreciated. The selecting force is to be found in the purpose and the related circumstances of the situation, together with more remote experiences of the individual so far as these are not included in the purpose. And as with movements the suggestions that prove on the whole more satisfactory are those that are guided by the wider experience, and by the more adequate appreciation of all the

INFERENCE

circumstances. The cue or the appreciated situation plus the purpose of the individual and his relevant experiences constitute the conditions that suggest the conclusion. The character of the conclusion depends upon these influences. When several tentative solutions present themselves one after another the attitude of the thinker varies for each.

The laws that control the suggestion of a movement are the same as the laws that suggest the thought. We may distinguish in each the suggestions that are immediately adequate from the solutions that are attained only after numerous trials, and when the correct solution appears at once it is due in each case to the proper interaction of cue and control. One may go farther in pointing out similarities since there is a constant interaction between the two sorts of reasoning. Purely ideal solutions ordinarily lead sooner or later to action and solutions in idea need frequently to be checked and corrected by solutions of a material sort. One can seldom picture the conditions so clearly that the construction in thought will be entirely adequate. One nearly always overlooks some essential part of the problem until the solution is transferred to material construction. I have

THE PSYCHOLOGY OF REASONING

been told by a scientist of great ingenuity in the construction of physical instruments that he has frequently tried to think out a device that should need no modification when it was actually built, but always without success. He finds that some essential factor is always forgotten until the parts are really seen. His memory for details is not sufficient to recall or construct all the factors of the problem. It is necessary to receive suggestions from the eye to attain an adequate solution. Reasoning as response and as mental construction then are mutually helpful and are frequently parts of the same process. They show the same varieties and are governed by the same laws. For practical purposes they may be regarded as of the same class.

Differences in reasoning then must be sought primarily not in the different ways in which conclusions are reached but in the different ways of testing the conclusions. Whether the testing or proving is by induction, deduction, analogy or experiment the conclusion is reached by the simple process of suggestion that we have described. The so-called forms of reasoning differ only in the way the results are proved, not in the way they are attained. This can be

INFERENCE

seen in many of the famous scientific conclusions that are on record. The most striking perhaps from the accuracy of the contemporary account is Darwin's doctrine of natural selection. We can trace in Wallace's account of the way the conclusion was reached both by Darwin and himself all the various elements of the reasoning process as we have analyzed them from the complex. Darwin's problem was set by observing the wide divergence in species among beetles with which he had been working all his life. The suggestion of the solution came suddenly from reading Malthus' "Essay on Population" and particularly from the suggestion that in the final struggle only the fit could win. The similarity of the conditions to those of his own problem struck him at once. The proof was for Darwin an inductive process and occupied him for twenty years. Still more striking is the fact that Wallace, with the same problem derived from a study of the same material, should get identically the same suggestion from reading the same work and should apply it in the same way and in almost the same words. The difference between the two men was found in the time devoted to proof. Wallace was content to publish the conclusion to the world on the

THE PSYCHOLOGY OF REASONING

proof of his own earlier observations and from more general considerations and analogies, while Darwin sought confirmation inductively by the study of a large number of separate instances.

The story of Newton and the fall of the apple, although probably apocryphal, illustrates the same point. Here the problem had long been present and the solution was suggested by a perception. To that extent the ordinary relation was reversed. The problem is usually in perception, the solution in idea, but still the solution can be traced to an association between the situation or the problem and the suggestion of the solution. Here too the final suggestion of the worlds mutually falling toward one another was in imagination, the perception is but an intermediate link in the chain. For Newton the proof was found in a reference to established principles as well as to observed facts, so that the reasoning would more nearly approach the process designated as deduction. In the more truly deductive reasoning of mathematics the conclusions seem to present themselves in the same way. (The proof alone is deductive. If one is solving a problem in geometry one tries one construction after another until some

INFERENCE

one is found that fulfills the conditions. The deductive phase of the process is the reference to general laws that constitutes the proof. Even in the experiment at the other extreme one does not try all possible combinations, but one first gets a suggestion as one gets it in induction and then tries the idea in practice. Of course there are experiments that consist of making measurements where the outcome is entirely unforeseen, but they would not give results at all comparable with deduction. They are not at all constructive in character. The ordinary experiment that contributes to an understanding of anything is a process of testing some conjecture. In the process new conjectures are constantly arising to be tested in turn, but that is incidental to the experiment in hand. All of the so-called different forms of reasoning or of inference are really different ways of testing conclusions rather than of proving conclusions. The conclusion always comes through association and then may be tested in any one of these four ways.

The qualities demanded of the thinker for the development of the conclusion are altogether different from those desirable for testing the conclusion. The one demands fertility and

THE PSYCHOLOGY OF REASONING

quickness of suggestion, the other conservatism in accepting the result when reached. The former is the perquisite of youth, the latter of age. A mind conservative enough for testing is often too staid and set for new suggestions. What truth there may be in the theory that genius is allied to insanity is probably contained in the fact that genius and mental alienation are alike characterized by great fluidity in ideas and a wealth of associations. Genius, however, is reasonably conservative and rejects many of the suggestions, while in the insane there is no restraint in accepting or uttering them. Many a slow and commonplace mind might be skilful in testing conclusions but never have suggestions worth testing, while many persons of fecund imagination are over-hasty in accepting conclusions. Adequate thinking obviously demands both qualities.

The net result of the present chapter is to see that judgment shades over gradually so far as expression is concerned from propositions that express a single appreciation and so a single judgment to propositions that combine two appreciations or some mental addition to the situation and so constitute an inference in the true sense. In the latter process one must distin-

INFERENCE

guish sharply between inference or deriving the conclusion, and proof or testing the conclusion. The former always depends upon the laws of association, the latter begins to act only after the conclusion has been reached. Proof is the more important operation and is the one that has always attracted the attention of the logician. All of the classical distinctions in reasoning have considered differences in proof not in the derivation of the conclusion. If judgment is the equivalent in logic of perception, inference is the equivalent of association. The only difference is to be found in the fact that inference is the association considered with reference to its truth. The prime function of logic is not to explain the origin of reasoning but to prove the truth of the conclusion when it has been reached. This problem must be attacked in the succeeding chapters.

CHAPTER VII

PROOF—THE SYLLOGISM

Before the nature of proof may be discussed intelligently it is necessary to consider the nature and effect in consciousness of general propositions. All forms of proof make explicit reference to general truths. In the deductive forms of proof the general statement is used to establish the truth of the particular conclusion, while in inductive reasoning general truths are supposed to be established on the basis of particular observations, or of particular instances. We must then face the problem of how these general statements differ in composition, origin and warrant from the particular conclusions considered up to this time.

By way of introduction it is well to recall what was said of meaning and the concept in an earlier chapter. There it was seen that mental processes usually, if not always, have a reference beyond themselves, that they mean not one thing but many, and that it is difficult to

PROOF—THE SYLLOGISM

distinguish the ideas that stand for one thing only from those that represent classes. An idea, if it is a real idea, is always a type. It is made a type by the context in which it stands and by the fact that it has developed out of a mass of experiences, not from one alone. The general statement or conclusion has the same origin and the same character. It is not necessarily different in kind or composition from the particular statement, but it stands not for a particular experience but for a class, for several not one. It is accepted as universal. The basis of this acceptance is quite as likely to be found in the absence of some quality as in anything that is added. The essential element in the general or universal is the acceptance of the particular mental somewhat as convertible into or replaceable by any other of the same or a similar kind. What the basis of the feeling of acceptance is, Wundt and the others who accept it do not pretend to say. It is undoubtedly on the same level as the representative basis of the concept, and is connected with the fact that mental states are all interwoven, with the fact that there are paths and lines of association that interrelate all the various mental states.

THE PSYCHOLOGY OF REASONING

That the general conclusion in this sense may be of identically the same kind as the particular, is evident if one will but study the mental processes in the simpler forms of general conclusions. The conclusions of the geometer are accepted as general in spite of the fact that he is looking at or thinking of but a single triangle or other figure. He uses a triangle of one size, of one particular shape, but expects his conclusions to hold true of all triangles without reference to size or shape. That the thinking is ordinarily with reference to the particular alone and that the other more general forms are only at the back of the mind if present at all is to be seen in the fact that one of the most difficult things to teach the beginner, and what now and again misleads the man who would probably spurn the designation of beginner, is to avoid making general, conclusions that will hold only for the figure that is before him. He insists in drawing universal conclusions as to triangles from an isosceles or equilateral triangle. In this case the inhibiting effect of earlier knowledge, or of the other sets of premises as given in the other possible figures is not sufficient, and associations are not properly checked in the formation, or not re-

PROOF—THE SYLLOGISM

jected when formed. Here the statement of the conditions of the problem acts very much as the attitude or problem that controls associations. Any conclusion is guided and controlled by the conditions explicitly stated, or generally accepted as holding for the given problem. When the presuppositions are changed to become more or less general, the conclusions that may be accepted will be correspondingly changed. Thus the non-Euclidean geometry may be regarded as related to the Euclidean merely in the removal of certain restrictions that had previously narrowed the constructions to harmonize with a single set of assumptions. Its conclusions may be regarded as related to the older form of the discipline in much the same way as the conclusions for the scalene triangle are related to the conclusions in reference to the isosceles triangle.

Very much the same relation holds between general and particular in the case of the inventor. When he constructs his model, he assumes constantly that what holds of his model or of his drawings will hold of all machines similarly constructed. As he develops his mental picture or his model he thinks always in terms of the one substance, the one arrange-

THE PSYCHOLOGY OF REASONING

ment, but there is the added belief that what holds for the one will hold equally for all cases that are essentially the same. We get back here again to the problem of belief. What we believe to be general is general for us whether it be pictured in one way or another. As in the concept there is no essential relation between the mental content and the use that we make of it. It is the use that is made of the conclusion, not the way it is represented, that determines whether we are dealing with that conclusion as an individual or as typical, and so general or even universal. Anything from the clearest picture of the individual, through images of all degrees of vagueness to the mere word and in some individuals to so much less that there seem to be no pictures whatsoever, may constitute the mental imagery. Whether there be much or little depends upon the individual type and is in no way essential to the generality of the conclusion. The most clearly imaged may be the most general, while the individual in whom the representation is practically lacking, if we can call his mental state representation at all, may have ideas that are altogether individual. This statement holds both for the conclusion that is intended to be general and

PROOF—THE SYLLOGISM

for the major premise of the ordinary syllogism. The statement "all men are mortal" may be represented in exactly the same way, may be accompanied by exactly the same kind of imagery, as the conclusion that the angles of a right triangle are equal to two right angles, with the obvious changes required by the difference in subject matter. Very probably since reasoning of this character is almost always merely for the sake of expression, the only consciousness will be of the words in which the statement is formulated.

When we return to the question of how conclusions once attained are to be justified, we find that fundamentally we are again face to face with our old problem of belief. The process of justifying a conclusion is primarily just by raising in the mind of the hearer or of the thinker a belief that the statement is true. The ultimate test of truth is that someone believes, and the task of assuring the truth of a statement is the task of making the individuals concerned believe the proposition that one is endeavoring to establish. Historically, two sorts of proof have been distinguished, the deductive and the inductive. The one derives the truth of the particular from some general principle already

THE PSYCHOLOGY OF REASONING

accepted by speaker and listener, the other supports a general proposition by specific instances. Each of these general classes has two lesser varieties. As forms of deduction one may distinguish the syllogism and the less rigid form of referring new to old, analogy. Under induction one may distinguish induction proper, which draws its proof from instances already known, and experiment which puts the suggestion to the test in some new way. These different forms of proof may be used in support of any conclusion and in fact more than one is ordinarily used to support any conclusion that is drawn. The methods are rather mutually helpful than mutually exclusive.

The syllogism as the oldest and best known of these may be discussed first. It assumes that the conclusion may be established by referring it to some one general truth. The general truth is expressed in the major premise, the minor premise serves to relate the conclusion to it. An instance may be found in the familiar

“All men are mortal,
Socrates is a man,
Therefore, Socrates is mortal”

of the texts on formal logic. It is unfortunate

PROOF—THE SYLLOGISM

that the instances of logic are nearly all taken out of their natural context in this way, and are treated as if each were complete in itself. As a matter of fact real reasoning always grows out of a particular purpose and always serves some practical end. The purpose, the ultimate end and even the particular setting are as much part of the reasoning as the conclusion and the premises. To understand the reasoning one must supply a context and this is not easy for the syllogism cited above or for many of the instances chosen by the familiar treatises of formal logic. One can think of trying to prove the mortality of Socrates only if one were a member of a band of assassins plotting his death or were arguing against him before the Areopagus and even in that case the term mortal would be used figuratively as synonymous with fallibility. Taken literally the major premise would add little, if anything, in this case to the force of the conclusion.

It will be well then to turn to some instance in which the context may be assumed to be known and study the relation of the syllogism to the conclusion and to the action that might result from it. Professor James' example of the smoky lamp will do as well as another. A

THE PSYCHOLOGY OF REASONING

servant, presumably ignorant, stops the smoking of a lamp by inserting a bit of wood under one edge of the chimney to admit more air. The actual process of reasoning or inferring will be completed when the movement is made or the idea presents itself. The suggestion may come as a memory from some similar instance, by mere chance trial, or it matters not in what way. The syllogism begins only after the suggestion has been made. Even then it does not always appear but will be supplied only when someone asks why it was done or the thinker becomes curious to understand the improvement that has been made. In each case the proof grows out of some preliminary doubt. The explanation is here in terms of some earlier accepted general truth that is implied in the act or thought.

That any process of justification can be given the syllogistic form may be illustrated by the smoky lamp and its remedy. In this instance the syllogism would be made up of a major premise: "The admission of an increased amount of oxygen will tend to make a lamp stop smoking." Then: "Inserting a bit of wood under the edge of the chimney will admit more oxygen." "Therefore insertion of a bit of wood under the edge of the chimney will tend

PROOF—THE SYLLOGISM

to prevent the lamp from smoking.” A further fact to be considered here is that it is never possible to formulate any set of premises that will exhaust all the proofs that might be given. We might make our syllogism upon a principal that is even more fundamental. Smokiness may be prevented by any means that will prevent an excess of hydrocarbons over oxygen in the process of combustion. Admission of an adequate amount of air will prevent this excess. Therefore the admission of an adequate amount of air will prevent smokiness. The major premise here requires other syllogisms to justify it and each can be made to depend upon some other in ever extending regressus. The regressus will extend not merely in a straight line but at many points there will be a bifurcation so that we shall have diverging lines of syllogisms that between them will include most of our knowledge of chemistry and then will probably depend upon much experience that has not been formulated. For instance we would in strict logic have to justify not alone the entrance of more air but the use of a bit of wood to support the chimney and this would require a syllogism for the strength of the wood. These again would divide into pairs that would con-

THE PSYCHOLOGY OF REASONING

sider the strength of the wood and the weight of the chimney each in a separate syllogism. Other syllogisms still would be required to guarantee us against the danger of using a combustible material, and that would consider the size of the particle and its relation to the size of chimney, rate of passage of air, etc., etc.

It would be very difficult to say that any one set of these premises would be more necessary or satisfactory than any other, and if any were used it would be difficult to prophesy in advance which of the many sets would be chosen as the more important. It is altogether probable that one set would be chosen at one time, another at another, all depending upon the difficulty that chanced to be prominent in the mind of the observer at the moment. Certainly, not all of the possible syllogisms would be formulated in any case and if they were they would run through a large part of our knowledge of the chemistry and physics of combustion, and would probably raise questions many of which are not yet definitely answered by science.

In any case one would have in the major premise merely a statement of some general truth already known to both speaker and lis-

PROOF—THE SYLLOGISM

tener. For some reason this general truth serves to give additional warrant to the conclusion; one is undoubtedly more ready to grant the assertion after the major premise has been suggested than before. The syllogism increases the belief of the hearer and of the thinker himself in the conclusion that has been already attained. To understand how this is possible one must turn back to the result of the examination of the nature and origin of the general statement.

The effect of the general statement is not direct. Certainly no new knowledge springs into being with the formulation of the major premise either in the mind of the thinker or of the doubter who questions how or why he concludes as he does. One is no more certain that Socrates or any other man will die, after he has been assured that all men are mortal, than he was before the statement was made. If the knowledge that finds formulation in the statement was not already in mind there would be no acceptance of the statement when it had been made. If one knew nothing of higher mathematics the citation of a differential equation of the third or fourth order would not add assurance to a doubtful physical proposition. I

THE PSYCHOLOGY OF REASONING

mean, of course, real assurance. It is true that one ignorant of mathematics or trained only in the lower stages has a respect for an equation that will lead him to pretend assent whenever an equation is cited against him; the equation will silence, even if it does not win him to complete acquiescence in the proposition. This however is not the effect of the major premise that is valuable. One would certainly not be said to grasp the force of the argument in a case of that kind, and an argument has no real effect unless its force is actually grasped. One might even give formal demonstration that one could not know the general statement unless all the particular instances under it, and hence the conclusion were also already known. It is evident then that the major premise does not confirm the knowledge in the sense that it adds something that was not present before, or that it adds new knowledge. The major premise is no more accepted on authority than is the conclusion. If it were accepted in that way we should not be dealing with reasoning in the true sense, at least in the sense in which it is used in every day life. For in every day life we question the truth of the premises just as strictly as we question the conclusion and in much the same way.

PROOF—THE SYLLOGISM

Only in classes in formal logic does one say let us assume that such and such statements are true and see what follows from them. In practical life an argument of this kind is likely to be met with a howl of protest that the assumptions themselves are wrong. Even in formal logic more care is taken than the extreme formalist would give us to believe, to be sure that the premises square with experience, not of course that it is assumed to make any difference to the method, but to avoid confusing the youthful mind. All this evidence that the major premise adds nothing new to the conclusion would tend to deprive it of any useful function, while as a matter of fact it has a place, is used, if not in the way that it is usually said to be. It is certainly true that you can make plausible to your objector a conclusion that he at first declines to accept if you will formulate for him the general principle under which it is subsumed. And your own assurance grows with clear and definite reference of your conclusion to already established principles.

What gives this feeling of satisfaction existence of which cannot be disputed or denied is not at all easy to say and so far as I know no altogether satisfactory explanation has ever been

THE PSYCHOLOGY OF REASONING

given. Were we Platonists or even did we hold to the metaphysical theory of the English Hegelians in a world of universals or a universal world that existed apart from the more mundane consciousness of every day life, we should have no trouble. The process would be one of transition from the concrete and individual world to the world of absolute verities. As psychologists however we are bound to attempt an empirical explanation, and this is the more enforced upon us since we have found that the character of the general statement that will be believed is colored by the earlier experience of the individual who accepts it. On this empirical level it seems that the general statement when made tends to suggest older connections, older bits of experience that have already been concerned in the development of the conclusion but which seem to gain verisimilitude when formulated in words. The associations, that were previously latent, now seem to add their quota to the vague feeling, and while not even then explicitly conscious they endow the new fact with a feeling of being accepted into the system of knowledge. Then there is something like the world of universals of the Hegelians when framed on an empirical

PROOF—THE SYLLOGISM

basis. Laws and principles of connection like the concept develop as types or standards about which the individual experiences cluster. As experiences accumulate they seem to crystallize into general statements toward which all other facts tend to gravitate. They persist while the particular elements out of which they were compounded disappear. Their persistence is probably due to the large number of connections that are made between them and other experiences. The general, the type, has been seen a vast number of times while the individuals have been in consciousness but once. They are then always likely to be recalled, or at least the likelihood of their recall is very much greater than the likelihood of the recall of any one of the elements that have gradually given rise to it. All of these associates too probably in some degree persist and tend to give increased probability to the general.

In fact, when the forms have once developed there is always a tendency to have them take the place of the particular even in perception. Whenever one hears a new theory propounded there is always a tendency to say that is the theory of so and so with certain elements of the theory of some one else. The deviations

THE PSYCHOLOGY OF REASONING

from the well-known formulæ will not be noticed at all. Much the same tendency is seen in the case even of single objects. New colors are referred to colors for which we have well-developed names, and the differences are not appreciated. In case one is presenting a new device to a man who is familiar with many similar ones there is the greatest difficulty in making him see that this is really new and not another variation of an already familiar pattern. The same holds equally of scientific theories. Nothing is more usual or more provoking to the man who believes that he has some new explanation or solution of an old problem than to be told that his is but one of the many deviations of an old familiar theory. We are all familiar with the man who assures us that all systems of philosophy are to be found in Plato or Aristotle. But, however completely we may assent to the general proposition, it is none the less discouraging when your own particular fondly-nourished deviation finds satisfactory resting place in the mind of your critic in one of the classical philosophers. However much the persistence of the type and the overshadowing dominance of the type may be deprecated in the particular instance, it is a fact that these

PROOF—THE SYLLOGISM

types develop as a framework for all knowledge and that any new bit of knowledge can be given separate existence only at the expense of considerable pain and repetition. Deprecate as we may the resulting conservatism of human thought, the tendency for the type to persist at the expense of the individual is undoubtedly a labor-saving device, and without some tendency of the kind all progress in knowledge would be impossible. The dominance of the type with room for variation certainly gives the most satisfactory results for retention, interpretation and progress.

If we get back then to our present problem of why the general statement, the formulation of the major premise, gives rise to the feeling of confidence in the truth of the conclusion, we find our answer in the fact that the general statement represents the type, and that the actually remembered framework of our knowledge is forged out of typical statements. If we ask how the framework, or the elements of the framework give rise to a feeling of satisfaction that is denied to the particulars out of which the typical has developed, we find the explanation in the fact that the general has hundreds or thousands of connections where the individual

THE PSYCHOLOGY OF REASONING

has but one. The associates too are probably not altogether mere dead potentialities but are in some way reflected in the consciousness of the moment, in vague feelings or in the absence of inhibitions and their corresponding consciousness, that attach to the particular. At present the feeling cannot be defined; probably it can never be defined except as a vague feeling of satisfaction. We are aware of the resulting confidence in the truth of the statement and the accompanying readiness to proceed to action. This characteristic of the general is closely related on the one hand to the feeling that accompanies the concept or the meaning, and to the feeling of belief on the other. All three are important for their functions and are known by their functions rather than by the structures, the feelings that accompany them. All three too undoubtedly find their explanation in very much the same cerebral and psychological conditions and antecedents. In short, the major premise or the general statement that justifies the particular conclusion, gives it a warrant not because it adds something to the particular or because its truth rests upon any other basis than the truth of the particular, but because it gives greater definiteness to the ex-

PROOF—THE SYLLOGISM

periences that warranted and induced the conclusion, and furnishes a resting point for the accumulated experiences to focus about and start from. Its value is psychological not logical, is primarily static rather than dynamic. It warrants, it does not induce; but the warrant comes from a rearrangement, or different action of forces effective whether the syllogism be formulated or not, and whether the major premise be expressed or not.

That the truth of the major premise and ultimately the truth of the conclusion should rest upon the belief process, should reduce finally to harmony with experience does not seem so radical if one recalls that the tests of the logician so far as they have been formulated are not so very different. Certainly formulations of the principle of sufficient reason are no more definite, and if analyzed would be found to be very largely made up of the fact that men in general were ready to accept them, believed them. There is sufficient reason when we are convinced, and we are convinced when we believe. Certain beliefs are more widely accepted than others and so are said to be fundamental. That means, probably, that they are connected with a larger number of experiences, and that the

THE PSYCHOLOGY OF REASONING

system as a whole would be more disorganized if they were rejected. It is belief, nevertheless, and nothing more. The belief has merely been highly developed and closely connected with many important facts and experiences.

The test of the inconceivability of the opposite is still more evidently but a phase of the belief problem. To say that the opposite is out of harmony with experience is but a roundabout way of asserting that all experience reinforces the proposition in question. It is belief asserted by two negatives and put in very strong terms. The more familiar tests of truth then reduce to our principle of belief with the exception of Pascal's clearness of ideas and Hume's closeness of association. Even clearness might be said to depend upon the reinforcement of other experiences and so to reduce to the same principle as belief. Hume's closeness of association has been tested heretofore and has not been found to agree with the facts. Many of the closest and strongest associations are unfortunate and must be rejected. Closeness of association ensures a hearing for the resulting suggestions, but like the slips of speech they are very likely to be refused acceptance when tested. Practically all tests of truth that have played

PROOF—THE SYLLOGISM

a part in history would reduce in one form or another to belief. This harmonizes with our own conclusion that the truth of an inference or of a major premise rests upon its being believed.

If the major premise warrants the truth of the conclusion because it is an expression of related and ordered experiences of the same class but of earlier acquirement, and the course of associations that give rise to the inference is in terms of large masses of related experiences, and belief is a result of the interaction of wide ranges of earlier experiences with the particular experience, it would seem that there might be some close relationship between all three operations. In the instance of the smoky lamp, only those associates will be favored by the educated mind that have some relation to the increased air supply. For an ignorant person the difficulty with the light might recall a host of older remedies, such for example as putting a screen about the light to shield it from a strong draft. In the intelligent mind this would be excluded unconsciously by the circumstances that indicate too little rather than too much oxygen and by numerous related experiences and facts. The same experiences

THE PSYCHOLOGY OF REASONING

then that confirm the conclusion when reached, guide it during the course of its development. To that extent and to that extent alone it may be said that the conditions and facts that are expressed in the premises are also the factors or are related to the factors that generate the conclusion. In so far one might say that the influences that implicitly guide the conclusion find explicit expression in the premises. But even granting this it must be added that the guidance is in terms of vague and ill-defined masses of experience not by definitely formulated propositions, and that at the most one can say only that the experience that guides is later formulated in the premises. It was not thus formulated at the moment it was exerting its influence.

It must be insisted too that the premises contain only an inconsiderable part of the knowledge that was guiding the suggestion. In the case in question the conclusion would be in terms of the effects not merely of the composition of the air and the consequent results of the increased draft, but also in terms of the knowledge of the combustibility of the substance used as a support and its nearness to the flame, of the strength of the substance and its prob-

PROOF—THE SYLLOGISM

able adequateness to support the weight of the chimney and of innumerable other considerations. Each of these might be made the major premise of a syllogism and used to prove the truth of the conclusion, but only one would be so used. This is the limitation of the syllogistic proof. It does not justify the conclusion by all of the means that have led to its production, nor by all of the elements that might serve to give it warrant. The premise that is chosen in practice is one that meets the objection of the person actually present or that serves to remove the immediate doubt of the thinker. In the instances chosen by the texts the major premise is assumed to meet the most likely objection, but it must always be a justification on one only of the many possible grounds that might be offered and that are needed to prove it completely. It can state but one of the many general truths that were implicitly involved in developing it.

The process of justification is also closely allied to the belief process. In fact the ultimate end of proof is to make the conclusion believed. The factors that give belief are the related experiences implicit in the control of the development of the conclusion and in part

THE PSYCHOLOGY OF REASONING

become explicit in the proof. Ordinarily there is no overt question of belief, the conclusion is accepted without hesitation and one proceeds to act upon it or takes the next step in the operation. One proves or attempts to justify only when preliminary doubt arises. This proof is in terms of the same sort of experience as that which is the basis of the tacit belief. As has been said these factors that work ordinarily without giving other sign of their presence than belief, work more effectively to give belief when they are stated in the explicitly formulated universal proposition. The forces that give belief are on the whole the forces that guide inference. The premises represent one of the masses of experience so far as it has been crystallized in the single statement. The three forces are in part identical. It might be remarked that the ordinary consciousness of the truth of any proposition or suggestion is more likely to lie in the feeling that the one suggestion is false rather than in the explicit approval of the correct conclusion. As suggestion after suggestion appears it is rejected until finally some one comes to which no objection can be raised. Here as everywhere the process that is definitely conscious is doubt and the conclu-

PROOF—THE SYLLOGISM

sion that is accepted is practically without peculiar sign or mark.

Reasoning and the justification of reasoning may have all degrees of definiteness. Ordinarily the accuracy of the adjustment of means to end goes hand in hand with the clearness of the justification. The first performance of any act of reasoning is very much like Lamb's fable of burning down the house to roast a pig. Some solution is recalled in the rough that will solve the present problem, but the essentials of the operation are not recognized. In the operation that we have used as an illustration it may be recalled merely that in times past raising one side of the chimney has stopped the smoke, and no other reason can be given. At the next stage it may be recalled that admitting more air will make a stove burn as well, and this general principle will support the other and serve to make the understanding of the operation more definite. From this point onward to the knowledge of the chemistry of combustion and of the composition of the air, all stages of definiteness of explanation may be recognized. Each stage is a warrant for the conclusion. It is the definiteness of the warrant and the degree to which the essentials are picked out that varies in each

THE PSYCHOLOGY OF REASONING

case. The more scientific the thinker, the more explicit must be the proof.

Analogy, the second form of deductive proof, has several points of similarity to the syllogism. Analogy deserves the more attention because, although it finds no place in the traditional logic, it is nevertheless the method that is perhaps most used in the arguments of every day life. The essence of the proof by analogy is the reference of a new or disputed statement to some older and accepted principle to which it is similar, but with which it is not identical. An instance is the use of the discovery or invention of wireless telegraphy to support a belief in telepathy. In the new form of transmission, messages are carried through the ether without special connecting wires or other paths. It is argued from this that the human mind might similarly send out some form of energy through the ether that would affect other minds rightly tuned to the sending individual. Without attempting to comment on the sufficiency of the proof, there can be no doubt that for most minds an analogy of this kind will strengthen belief in the fact supported by the analogy. The degree of belief that is aroused will depend upon the closeness of the similarity between

PROOF—THE SYLLOGISM

the statement to be proved and the accepted fact that is cited to prove it. Where the two are closely similar, the proof will be regarded as strong; where the difference is great and affects vital parts of the analogy, the proof will be weak down to the vanishing point. In the argument for telepathy just mentioned, the case would be much stronger if one could point to anything in the human brain that corresponded in any degree to the transmitting or receiving apparatus of the Marconi system. The similarity would thereby be considerably increased. But the lack of an essential point in the similarity is by no means fatal to the belief that is engendered by the argument. One inclined to believe would insist that there was still a possibility that some way of sending out the influence might be discovered later, or that it might be too delicate ever to be discovered, but still exist, and be proved to exist by its action. As the negative of a proposition is very difficult to establish, the force of the analogy could never be entirely destroyed.

At the same time it is not possible to reduce the analogy to syllogistic form. One may even say that there is no possibility of giving rigid proof of any kind by analogy. It is always

THE PSYCHOLOGY OF REASONING

possible that the similarity may be elusive or in a non-essential. It is always at least possible that the discovery necessary to reduce the similarity to identity may never be made, and at the best until the discovery is made there is no certainty attaching to the proof. From this point of view it is remarkable that it should find so large a place in reasoning, both popular and scientific. Why does it give so definite a warrant? Why does it arouse belief? If we are to draw a distinction between logic and psychology, we must look to psychology rather than to logic for our answer. But on the other side, the nature of the warrant for the proof by analogy is not so very different from the warrant for the belief in the syllogism itself. Both draw their justification from the results of earlier experience definitely formulated in laws and maxims. We have seen both in the discussion of belief and in the discussion of the proof given by the syllogism that we are willing to accept anything that can be united with the general mass of our knowledge. Analogy serves to give this union by assimilating the new or doubted proposition to some law or principle that has already been established and is accepted by both speaker and listener. The

PROOF—THE SYLLOGISM

human mind is so anxious to get all experience arranged in some sort of order that it is none too close in its scrutiny of any scheme that will permit a systematic ordering of its knowledge. In this respect, reasoning from analogy is but one expression of the tendency to take over all experiences into the predeveloped types of which we have made so much throughout. There is no real acceptance of any fact until it has found a resting place in some concept or law, in the framework of our knowledge. The result of accepting an analogy is to dispose of a new fact under a familiar head. It is put into an old class where it may be easily handled. Until disposed of in some such way, the fact always causes unrest; there is relief when it is given a place, even temporarily. Analogies then find the readier acceptance from the fact that they furnish an anodyne to thought. They give repose where otherwise would be conflict and irritation.

It must not be supposed, however, that reasoning from analogy always or even usually conduces to fallacious conclusions. In fact the warrant that is provided by analogy is but a stage removed from the warrant that is given by the syllogism. As has been seen, the only

THE PSYCHOLOGY OF REASONING

warrant for the truth of the major premise of the syllogism is the fact that it is believed, that it has been wrought into the framework of our knowledge and has been found to harmonize with the other elements of that knowledge. Reference of the conclusion to the major premise has value only as it serves to connect it with something that had previously been explicitly accepted. Proof by analogy is identical with proof through the syllogism in that both give truth only through connection with something that has itself been accepted as true. The only difference lies in the nature of the reference. In the syllogism the conclusion is made a particular instance under a general proposition; in analogy the conclusion is asserted to be merely similar to the general proposition or to some other accepted particular. This difference is slight when the analogy is close. For the particulars that are referred to the general are not always identical with it. If they were identical there would be no need for the reference. If the analogy is close, there may be as much similarity between the conclusion to be proved and the accepted law to which it is referred as there is between the particular and the general to which it is referred

PROOF—THE SYLLOGISM

by the syllogism, all the more if the syllogism be somewhat loose. In close analogy we approximate the syllogism. In the less rigid forms of syllogism we approximate the argument from analogy. The dividing line is easier to draw than in most of the distinctions that we have investigated, but just at the dividing line it is not always easy to say whether an argument is a very close analogy or a somewhat loose syllogism. At the very least, it may be asserted without fear of contradiction that what gives plausibility to the analogy is the same sort of general statement that affords proof in the syllogism. The two forms of reasoning belong in the same class, and ultimately draw their validity from the same source.

In view of the somewhat scattered treatment, it may be well to cast a glance back over the discussion of inference and deductive proof. First we define inference as the process of improving or changing the given situation, either actually or in imagination. Judgment furnishes the appreciation of the situation, inference the improvement. If, as is usually the case, the inference arises from the blocking of some habitual action by a difficulty, judgment is the appreciation of the difficulty, inference the dis-

THE PSYCHOLOGY OF REASONING

covery of a method to obviate the difficulty when appreciated. The psychological operations that give rise to the imagined improvement are the laws of association controlled and guided by the attitude of the moment, by the mental context. But the more essential part of the operation, if degrees of essentiality are to be recognized, is to be found in the operation of selecting from the solutions offered those that fit the particular set of circumstances. Often one tries various suggestions until one is finally found that promises to be suitable to the situation. When the problem is merely imagined, the operation of discovering a solution is not unlike that of Professor Thorndike's cats in escaping from a box. One imagined solution after another is tried until one comes that promises to work and this is then accepted. The origin of the suggestion is probably not always due to chance, since the correct solution of the problem arises only in the mind that has the right sort of knowledge and is at the moment in the right attitude toward the knowledge. Suggestions may present themselves in any mind through bare mechanical association, but in most cases the association is guided by large elements of experience that insure or at least make prob-

PROOF—THE SYLLOGISM

able that the correct solution will present itself.

Distinct from the origin of the suggested improvement is the process of testing. An inference, no matter how it may have originated, must be tested before it is accepted. The testing is one phase of the belief problem. What harmonizes with experience will be accepted. The experience that tests is in large measure the same experience that generates the improvement. In most solutions of the problem there is no thought of the truth because nothing prevents the immediate acceptance; the conclusion is in complete harmony with the knowledge of the individual. In fact, in many cases there is no consciousness at all. It is only when there is some check, some doubt, that the testing is conscious. When the check comes, we make explicit reference to earlier experience as it has been formulated in a general law. This reference may be formal as we find it in the syllogism, it may be informal as is more usual in every-day life. In either case the effect is the same. Some crystallization of early experience is called to witness. If someone questions your use of tungsten to close an electric circuit when some emergency arises, you may either construct a syllogism with "all metals conduct," as

THE PSYCHOLOGY OF REASONING

the major, "tungsten is a metal," as the minor, or what is more likely you would simply say, "tungsten is a metal" and let him supply his own major premise. The effect in either case is the same. Belief is made to attach to the conclusion by connecting it with some earlier formulated general principle. That in its turn derives its truth only from the experience that it formulates. That an explicit formulation of the knowledge that is implicit both in the control of the association and in the immediate acceptance of the result should give greater assurance is a fact on the same level as the feeling of definiteness that attaches to the type.

It is to be noted that the syllogism and analogy apply not to the development of the inference but to its proof, and even then do not have a place in the mental operation unless the conclusion is questioned after it has been formulated. Deduction is a method of proof, not of reasoning. General conclusions have much the same character as particular conclusions. The method of production is the same, very often the imagery is the same. The only difference is that the restrictions of the particular process are removed. The general is merely the particular as the typical. The process of inferring

PROOF—THE SYLLOGISM

in general is the same as the process of inferring in the particular. The only difference is that the starting point and the conclusion, the interpretation and the improvement, are typical rather than particular.

CHAPTER VIII

THE NATURE OF INDUCTIVE PROOF

The proof most favored by the formal logician, the logician in general in fact, is the deductive, particularly the syllogism. It is probable, however, that science and popular thought place the emphasis upon induction and for science particularly upon experiment. It is true that the ordinary argument in a cross roads store is pervaded by reference to high-sounding general principles, but even more frequent is reference to some particular instance as proof of a general principle. Inductive proof differs from deductive primarily in that while the one ordinarily seeks the warrant for a general statement in a series of particulars, the latter finds justification for the particular conclusion in a general law. This statement is to be modified in part since the conclusion in deduction is frequently general and the suggestion to be justified by induction is now and again particular in form. The justification is, however, in the

NATURE OF INDUCTIVE PROOF

one by reference to a general statement, in the other by reference to a number of particular observations. We may again emphasize the statement that the difference between induction and deduction is always in the sort of proof that is offered, very seldom in the way in which the conclusion is reached. The conclusion in induction is given by the same sort of associative laws that suggest the law that is proved deductively. The law may be suggested by something actually observed, it may come from some other bit of knowledge as was true of Darwin's doctrine of natural selection. In either case the solution of the problem that suggests itself is proved by the accumulation of a large number of particular instances that can be explained by it or that are in harmony with it.

The way in which the general statement is referred to the particulars for its justification need not concern us here, since no special form or technique of reference has been developed as was true of the syllogism. But one must ask how it is possible to prove general statements by particular instances. As has been frequently pointed out enumeration can never be exhaustive. Even if it includes every event of

THE PSYCHOLOGY OF REASONING

a given sort up to the present, it is not possible to say anything whatever about the future, unless one goes beyond the actual warrant of the enumeration. Inductions are never complete and so in strictness prove nothing. As a matter of fact all this discussion is beside the point for most of the proof in induction comes not from the particular as particular; the real value of the instance is as a type, as the expression of a previously established law or principle. The necessity for choosing many instances rather than one is that the different instances contain the typical principle in connection with different subsidiary and irrelevant details. To make sure that the details in other cases are irrelevant the typical part must be seen in as many different connections as possible. One would not care to find many instances of selection in the same species in Darwin's case. Or were one studying the structure of mammals in reference to some point one would not care to examine many animals of the same species. Except for the possible individual variation on minor points one would be content with a thorough examination of one. Still truer would this be of the magnetic properties of iron. If one knew the chemical composition of the

NATURE OF INDUCTIVE PROOF

iron he would be content to investigate a single specimen thoroughly and use his results as true for all specimens. Were his results to show deviations he would assume that there had been some change in the conditions of the experiment or some inaccuracy in the observation. He would accept the result as true for all specimens and conditions of the type. Confidence comes, then, not from the number of observations, but from the closeness with which the things observed may be assumed to represent typical conditions, to embody types. If the objects observed are not typical, the observation is valueless.

Inductions from another point of view depend not at all upon the results of enumeration, but upon the relations of a general statement to other subordinate general statements that have been established partly by observation, partly by the agreement of observations with each other over long stretches of time and under numerous different typical conditions. For example, the favorite major premise of the formal logician "all men are mortal" could never be established by mere enumeration. It does depend upon observations undoubtedly, but these are of the conditions of life and subordinate

THE PSYCHOLOGY OF REASONING

laws of that character rather than of vital statistics. We know that man must die from our study of the conditions of waste and repair in the organism and from the suitability of the animal tissues as culture media for pathogenic organisms. Each of these laws is the outcome of long observation and experiment, but fully as much from the observation of animal tissues as of human. Each of the statements represents a large mass of experiences that are harmonized with each other in the statement and are also known to harmonize with all relevant knowledge. Induction here approaches very close to deduction.

In one other particular are the separate observations that together constitute induction like deduction. Each perception has been seen in an earlier chapter to involve the results of accumulated experiences that unite to constitute meanings. Pure observation under the most favorable circumstances does not represent the entrance to consciousness of purely unbiased and totally new facts; rather is it an occasion for the rearousal of earlier developed generalizations, under the influence of the problem that dominates consciousness at the moment and on the occasion of the stimulus that presents

NATURE OF INDUCTIVE PROOF

itself to the sense organ. When one turns to observe events in the external world to test some new suggestion, one sees objects that would not be noticed did one not have the problem, and one sees in them elements that would not otherwise be observed. The results of the perception are interpreted by earlier acquired meanings and laws. Neither need affect the validity of the observation except favorably, but they undoubtedly make one see what would otherwise pass unseen. It must not be assumed either that the stimulus is merely the occasion for the rearousal of earlier generalizations and crystallizations of experience. The new perception, while largely the embodiment of early knowledge, in nearly every case modifies the older mass, or at the very least the old is confirmed anew by the fact that it fits into the new setting satisfactorily.

Not only does the earlier accepted general principle contribute in part to the content of the perception, but the validity of the observation will depend very largely upon the degree of agreement between the new and the old. When the new fact does not find a resting point in the body of knowledge it seems to baffle, it is not understood and is with difficulty accepted.

THE PSYCHOLOGY OF REASONING

A very good illustration of this is furnished by the results of the experiments of Michelson and Morley that demonstrate that there is no ether drift, no displacement of the light waves by the motion of the earth through space. The fact is established as completely as any fact may be established, but apparently it can not be related to the accepted general principles in the same field—it stands alone. Two alternatives apparently present themselves. An attempt has recently been made to develop a new mathematics that shall include this fact with others in its explanations. That is, one may modify the old principles to include the new fact. Were the observations less trustworthy the other alternative would be to reject the results and keep to the old principles. As it stands without relation to old principles it is not understood and stands as a perpetual thorn in the side of the physicist, a dire foreboding that somehow his developed system contains a flaw that may bring disaster to the whole. Induction is like deduction in its dependence upon earlier developed general laws and meanings.

Even the most highly developed and most carefully guarded form of induction, experiment, shows the same dependence upon earlier

NATURE OF INDUCTIVE PROOF

developed laws and principles. Experiments perhaps more completely than observations grow out of suggestions developed in advance. Experiment is a form of proof. As with all sorts of proof experiments are made only when the suggested conclusion is in some way in doubt or when alternative possibilities present themselves. Experiments are not made at haphazard, but one usually has a definite expectation of the result that is to be obtained or of the range within which the result will lie. One not only has a definite problem in mind when the experiment is begun but ordinarily has an idea of what the answer is to be. The only case in which the results are unforeseen is in experiments to obtain exact measurements. Even here the problem controls the course of the experiment and the values are assumed to lie within certain ranges. It is true of course that occasionally an experiment will give an unexpected result, or that the experiment will give rise to problems that will themselves open new fields of investigation. Often, too, some phase of an experiment will suggest an answer to a problem that has long been before the mind. These results are all incidental to the main purpose of the experiment. The experimenter has

THE PSYCHOLOGY OF REASONING

them in mind only in so far as he is aware that the best results of investigation are often unforeseen.

Experiment is like observation in the usual inductive proof, too, in that what one sees in the experiment will depend very largely upon the problem to be solved. Frequently the same operation contains the proof of several hypotheses but only those phases of the experiment are noticed that are related to the particular problem in mind. Experiment exhibits the effects of earlier experience in two other ways. It must supply the meanings that interpret what is immediately seen and also provide the means of understanding the results. The former is merely another expression of the general law of perception, the effect of the action of the old in enabling one to understand the things seen in the experiment. In an experiment one ordinarily understands the general outcome at once, but it is often the case that the true meaning of the parts is appreciated only gradually, ordinarily one part at a time. When each part is appreciated it is referred to some general principle. It is only as the parts of the operation are seen to embody general laws that the experiment is understood in its entirety, and the

NATURE OF INDUCTIVE PROOF

degree in which it is understood depends upon how far it is possible to see it as typical of earlier established formulations of experience.

Induction by observation and by experiment are essentially alike in that each is primarily a process of proof, not of inference. In the proof, too, each is in three respects dependent upon the same sort of general propositions as are contained in the premises of the syllogism. The course of the observation or experiment is guided by the general principle already suggested as the solution of the problem. The interpretation of what is seen consists in referring the materials of sense to meanings and general laws, and the results in each case are understood only as they may be referred to these earlier explicit formulations. While emphasis has been put throughout on the part that general principles and earlier experience has played in inductive proof, it is of course hardly necessary to say that as a result of these new observations the old formulæ are constantly changed. The old is constantly interpreting the new, but the new, on the other hand, is also constantly even if gradually transforming the old. Otherwise there would never be progress in knowledge.

THE PSYCHOLOGY OF REASONING

The difference between proof by induction and by deduction is by no means so great as it is often assumed. The traditional difference makes one depend upon general principles, the other upon particular observations either before or after the proof is undertaken. As has been shown repeatedly the general principles are themselves not independent of particular experiences, and particular experiences probably do not exist. They are always particular instances of general principles, types or laws. The difference between the two sorts of proof is that in the one we have the conclusion justified by experience crystallized, in the other we have justification by new experiences interpreted by the old or embodied in the old at the moment of perception. Probably inductive proof is the more valuable because it adds some new experience to that already accumulated which is active in the control of inference and in giving informal belief. Both forms of proof are alike in that they consist in showing that the conclusion harmonizes with experience: in the one case with earlier experience formulated into general laws, in the other with general laws that are supported and confirmed by definitely enumerated observations or experiments.

NATURE OF INDUCTIVE PROOF

Inductive proof not merely states the general principle but gives some of the concrete experiences upon which it depends. These serve to confirm if not to modify in some degree the old formulæ. It brings new experience as well as the old to test the suggestion. In this alone does inductive proof differ from deductive.

Since induction and deduction are in the history of logic treated not merely as different forms of proof but as different forms of reasoning as a total process, it may be desirable to ask again whether it is possible at all to distinguish differences in the way conclusions are derived as well as differences in the way they are established. Regarded in this traditional way it is easy to define the two processes. Deduction is the process of obtaining new truths or applications from general principles. Induction is the process of obtaining general truths from particular observations. While the definitions make them sufficiently distinct, slight consideration shows that they have many points in common. As has just been said, all perception results in the appearance of a general, not a particular. The simplest perception, then, really gives rise to a universal, not to a particular. If this statement be generalized and applied to

THE PSYCHOLOGY OF REASONING

induction, we see that the particular never appears in consciousness as particular. Even the most concrete object or percept when it enters consciousness has already become a type, has taken on meaning. This same conclusion may be applied, if it has not been applied, to dynamic relations as well as to any other relation. One no more sees a single succession of events as a bare succession than one receives a group of sensations as a bare group of sensations. This, too, at its first apprehension is referred to some predeveloped law. The recognition of the fall of a single body constitutes reference to a general law just as truly as the recognition of the movement of the heavenly bodies as one phase of the attraction of body for body is a reference to a general law of a more inclusive sort. The difference between the two recognitions is largely if not altogether in terms of the amount of material that is combined in the recognition. The perception of a falling body would probably be called induction; the formulation of the law of gravitation as a principle applicable to all masses everywhere would certainly be called deduction.

Before the first induction of this simplest sort there was certainly some crude type of refer-

NATURE OF INDUCTIVE PROOF

ence. The body would not be recognized as falling unless there were other forms of motion that were already known from which it might be distinguished, as well as other instances of falling to which it might be referred. Perception would come only when early experiences had been in some way united to form the type. The question of the order of development is not essential, but it is important and may be repeated that there is no perception of object, movement, or relation unless there be connection with pre-formed type. In other words, as we were compelled to assert earlier that there is no concept, meaning or universal that does not develop through experience, so we may say that there is no particular experience that becomes a real experience, except through the help of a pre-formed meaning, of an earlier developed universal. If the particular is essential to the development of the universal, the universal is equally essential to the existence of the particular. If the type is always present in perception, it follows that induction is like deduction in so far as it can not go on except on the basis of and by the help of earlier acquired experience. The two are alike also in that the earlier acquired experience is effective not in

THE PSYCHOLOGY OF REASONING

the form of raw material, but as it has crystallized into types or universals. As has been shown in some detail, the forces that direct and control the construction of the percept are practically identical with the forces that guide the operation of constructive reasoning. The materials of which the percept is formed are identical in large measure with the materials of abstract thought, and the resulting meaning is of the same character and often on the same level of generality. Each again has the same measure of truth, and it is applied in the same way.

The only apparent difference between them is that in induction one starts on the stimulus of some external impression and proceeds to the universal, while in deduction one proceeds from the interpretation in which the induction ends and proceeds to some improvement in the thing interpreted on the basis of accumulated experience. One passes from particular occasion to a general truth, the other makes a particular application of the earlier developed universal. One begins in the particular and ends in the general, the other begins with the general and ends in a particular application. In fact, the similarity is even closer

NATURE OF INDUCTIVE PROOF

if we extend the time over which the operation is considered, since there is no case of deduction that does not arise on the spur of practical need and have reference to some particular occasion while, on the other hand, there is no induction that does not have as its end ultimate application in some practical way of the results attained. With this extension every bit of reasoning, inductive or deductive, makes the complete circuit from particular occasion in the stimulus through the accumulated experience that is embodied in the universal to the particular application in the improvement of actual conditions. What we call induction and deduction are but arcs of the one circle, and it is by no means easy to distinguish the beginning of one from the end of the other. In actual practice they overlap in a considerable portion of the total operation.

One can not have knowledge without the accumulation of experience, but also one can not have experience without preliminary knowledge developed and arranged in types. The two processes are reciprocal. One could not exist without the other. It is even difficult to determine in our adult consciousness which came first in the development of knowledge.

THE PSYCHOLOGY OF REASONING

It would seem that there could not be observation before there were types into which the results of the observation might be taken up and by which they might be given form, but we also can not conceive of the development of types except through the accumulation of experience. It is probable that in the earlier stages the two processes went on together. Before there were types or universals in our empirical sense, there was no articulate knowledge even on the level of perception. Distinct consciousness developed out of the original chaos *pari passu* with the development of meanings and concepts. What there was before this development of articulate consciousness, one can not imagine. It was probably not unlike the moments of disorientation of the earliest awakening from sleep or an anæsthetic, or even like the consciousness during sleep. But on the other hand, the types or meanings seem dependent upon consciousness, and develop out of it. The development of the one is dependent upon the other and must go on together with it. The change of types in our developed consciousness is probably similar to the changes that went on in the early stages. Probably the first types were vague and general, and imparted their

NATURE OF INDUCTIVE PROOF

uncertainty to consciousness. As more and more experience was acquired they became more sharply defined, always reflecting the kind and amount of knowledge. Fortunately the problem of the development of types does not concern us directly. It was only raised to suggest that while there is no consciousness that is not consciousness of meaning or type, the meanings or types have themselves been derived and are being derived through experience.

Induction is not, as it has been sometimes pictured, a conscious and labored attempt to derive general principles from discrete particulars. If it were, it would never be possible to obtain universals or even general statements. Deduction, on the other hand, is not a process by which one truth is derived from universals already established without reference to the use to which it may be put. Any reasoning that is of the least practical value is devoted to the solution of a particular problem under the spur of necessity, and in the solution of the problem it must always draw upon accumulated experiences that have taken on the typical or universal form. Each operation is part of a larger whole of thought. It has no meaning apart from that whole. The round from induction to deduction

THE PSYCHOLOGY OF REASONING

is never ceasing. One can in practice scarcely distinguish them. If one keeps close to the actual practice it is almost impossible to define induction in a way that shall not describe deduction almost as well. They are complementary parts of a single whole. The process of reasoning as we have sketched it is not what the older authorities would call induction nor is it what they would have called deduction. It partakes in part of the nature of induction, still more perhaps of the nature of deduction. So completely do the two processes fuse in the actual operations of reasoning, that it is difficult to select from the resultant the part that belonged originally to one and the part that originally belonged to the other.

CHAPTER IX

DEGREES OF TRUTH. MODALITY AND PROBABILITY

It must be remembered that conclusions when established are not regarded as equally certain. It matters not how the conclusion may be reached or how it has been proved, one finds that all are not equally assured. It is obviously important that the degrees of certainty of conclusions should be established, that they should be graded with reference to their probability, and if possible that the conditions that make some seem certain, others less certain should be stated. Two general groups of discussions of the degrees of truth have been developed in the history of logic and of science. One attempts to grade the truth of conclusions that have been warranted deductively, the other to measure the likelihood of conclusions that have been proved by reference to specific instances in observation or experiment. The one can grade the degree of probability only roughly and in consequence devotes most attention to making clear

THE PSYCHOLOGY OF REASONING

the limits within which the statement will hold or the circumstances that make it seem probable. The other measures the probability more closely but is perhaps less successful in assigning the grounds that give truth. The one is covered by the term modality as it is used by the formal logician, the other leads to the mathematical theory of probabilities. Each recognizes that a statement is likely to be true within limits only, and that if true, it will hold not of every specific instance that would seem to fall under it, but of a certain proportion only.

The logician discusses the probability of his conclusion under the head of modality. The logician usually regards it as the modality of the judgment, but, as we have seen, what he calls the judgment is practically identical with what we have found to be better described as the inference or conclusion. The logical problem of the modality of judgment is really the problem of the modality of the conclusion, or at the very least the modality of the conclusion and the judgment. By modality the logician means the measure of truth, or the degree of certainty that is ascribed by the thinker to the conclusion when it is reached. Some conclusions are apparently regarded as

DEGREES OF TRUTH

true without condition, others are regarded as true under assignable conditions. Of this last group, the conditions are sometimes stated, sometimes assumed to be known and not stated, sometimes are regarded as entirely unknown. The best known types of the modal judgment are the hypothetical, in which it is asserted that something is true if some preliminary condition is complied with; the disjunctive in which two alternative sets of conditions are stated with the results that would follow from each if true; and finally the general assertions of probability and possibility, where no conditions are explicitly stated and no measure of the degree of probability can be given except in terms of a mathematical treatment of empirical facts. To these might be added necessity which, however, may be regarded as a high degree of probability and in any event offers less of interest psychologically than the others.

Each of these types of modal judgment may, I think, be very easily brought under the laws of the syllogism and its psychological conditions as sketched above. It has been insisted throughout that the conclusion reached is conditioned and controlled by the setting in which it occurs and that this in turn is dependent

THE PSYCHOLOGY OF REASONING

upon and is an outgrowth of the more remote experience of the individual. When these conditions become self-conscious and are expressly formulated, we have the hypothetical and other modal judgments. When one appreciates the fact that a conclusion depends for its truth upon the truth or adequacy of the mental grouping or setting out of which it grows, and is able to state at least a few of the elements that have led to the conclusion, one has the hypothetical statement. Of course, again, every conclusion depends upon other related experiences for its truth, but the dependence is not always recognized. In this sense one may agree with Bradley that all categorical statements are really hypothetical. We are not at the moment conscious that they have grown out of a particular mental attitude, of a single group of experiences, but a little examination of the changes that would be made in the statement, were the attitude or the wider experience to change, is sufficient to indicate that the statement depends for its truth upon the truth of the context. It is but another way of saying that a proposition can never be true except in its context, be the context verbal or mental. Ordinarily the truth of the context is taken as a matter of course.

DEGREES OF TRUTH

It is probably only when there is reason to doubt the truth of the statement, when there is conflict between two sets of experiences that are recognized as related to the conclusion, that the conditions become conscious. In this sense, the statement of the hypothesis is closely related to the statement of the premises. Both come after the inference has been completed and both come only when there is some doubt, when there is something to disturb the assurance of certainty that normally attaches to the inference. The difference appears to lie in the fact that in the ordinary syllogism doubt is dispelled on examination; it is possible to refer the conclusion to general principles that are self-consistent and consistent with the entirety of experience, while in the hypothetical proposition, the doubt is not resolved on examination but confirmed and the most that can be done is to push it one step farther back to a doubt concerning some one general proposition. Take an engineering problem for example. One asserts that the dams on the Panama Canal will be sufficiently stable provided they can be placed upon a firm subsoil or bedrock. The subsoil, the commission tells us, will be stable enough provided the ground water can be kept out from

THE PSYCHOLOGY OF REASONING

it, and the ground water in turn can be kept away provided it is not under too great pressure and there is a waterproof stratum sufficiently near the surface. On the final supposition one might or might not be in a position to commit one's self. Did one know the facts in advance as would ordinarily be the case before the hypothetical judgment is formulated, the bits of knowledge that constitute the hypotheses would be concerned in the original statement in giving to it its degree of probability or improbability. There would under these circumstances be bits of knowledge that would make for each of the two possible conclusions that the dams would stand, and that they would not. In the resulting proposition there would be either a qualified affirmative or a qualified negative. When the problem is analyzed still farther, the opposing sets of considerations come to explicit consciousness in the hypotheses and the doubt is pushed back and centered upon one single proposition, and that is neither affirmed nor denied. What is meant by asserting that all general categorical statements are hypothetical is only that all assertions depend upon the coöperation of similar bits of knowledge and that one must, in asserting the truth

DEGREES OF TRUTH

of any proposition, go backward in a never-ending regressus of experiences before one can assign the real basis for acceptance or rejection. Tacitly at least each statement that can be made depends for its truth upon something else, no matter how far one cares to push the investigation. Since one must stop somewhere in the assignment of reasons, the last step may always be regarded as the hypothesis upon which the more immediate statements rest. We ordinarily have the feeling of belief that comes with absence of contradiction among our experiences with reference to any point, and are not inclined to raise the question of the probability of our conclusion. The interdependence of our inferences passes unnoticed, but it none the less exists as can be seen by the examination of any simple statement.

The disjunctive judgment or inference is closely related both in the conditions of its origin and in its fundamental basis to the hypothetical judgment, inference, or proposition. The hypothetical judgment always arises, as was said, from conflict or opposition between different elements of experience. The disjunctive judgment arises when one becomes conscious of the conflict and of its conditions. The

THE PSYCHOLOGY OF REASONING

only difference is that the disjunctive form of expression is assumed when the opposition is between two sets of elements alone, and it is certain that no other possibilities can present themselves. The possibility of limiting the opposing suppositions to two is an important positive addition. It requires fully as much certainty about the nature of one's knowledge to assert that in any given case there are but two points of view from which a subject can be viewed, and two corresponding conclusions that can be drawn from the given set of facts, as to assert any positive fact. The disjunctive form of statement arises with reference to a practical situation when a conclusion is reached that is accompanied by doubt. Then it is found that there are two general formulations of experience to which the conclusion can be referred, and that when referred to one, one inference is necessarily drawn, when looked at in the light of the other, another inference is made. The practical advantage of the disjunction comes from the fact that it is not at all infrequently the case that which of the two inferences be correct is indifferent to our action. If the given situation is of one kind, our course of action will satisfy the conditions equally as

DEGREES OF TRUTH

well as if the situation proves to be of the opposite kind. Or if they be not altogether indifferent to our proposed line of action, we may at least be prepared for eventual decision in either way. Suppose for instance a physician is presented with a case of mental alienation marked by definitely developed and firmly fixed delusions. He has had no opportunity to study the case history or fully to trace out the other symptoms of the disease. He is, however, in position to state with definiteness that the patient is suffering either from dementia praecox or from paranoia. (We may assume for the sake of argument that the diagnosis has been sufficient to exclude some of the other forms of delusional insanity.) This alternative diagnosis will suffice for many purposes. It will suffice to warrant the commission of the patient to an asylum, and will warrant the physician in holding out little hope to friends and relatives for the ultimate recovery. Furthermore it will be possible to advise a subordinate or a layman that if certain new symptoms develop the case will fall under one of these two heads, while if other symptoms develop it will fall under another head. In either case provision can be made in advance for the treat-

THE PSYCHOLOGY OF REASONING

ment of the case to the practical advantage of all concerned.

It will be noticed that in our nomenclature what is affected by the uncertainty in the disjunction is the judgment proper, the appreciation of the given, while the hypothesis affects the inference. If our observation is guided by one set of factors, by one context, one interpretation will be made, if guided by another, another interpretation comes into being. This interpretation is the basis for the inference but it is not the inference itself. All disjunctive judgments then limit the interpretations that may be put upon a presented somewhat or are memories of such limitations of possible interpretations. From the disjunctive judgment one may look either backward or forward; backward to the conditions out of which the interpretations might arise; forward to the resulting methods of dealing with the possible interpretations. Each of the two interpretations would necessarily lead to at least one conclusion. The hypothetical form may be taken by the judgment as well as the inference in the true sense, but this is not so frequent. One might say of an object at a distance, that it is a man if it moves in the upright position, just as we may say of

DEGREES OF TRUTH

our case of mental disease, that it is more likely to be paranoia if it has remained without increased deterioration for a term of years, or if the group of accompanying mental processes is of one kind, the case will be called paranoia, if of another, *dementia praecox*. The hypothesis more usually attaches to the inference; the disjunction affects the interpretation of the situation, as the coming to consciousness of the context into which the object to be interpreted must be taken up. The hypothesis on the other hand arises when the conditions that are controlling the inference become self-conscious. There is the further difference that the disjunction definitely limits the number of possible ways of considering or interpreting the given, while the hypothesis recognizes but one of the conditions and does not attempt to deny that there may be others that are equally to be taken into consideration. The disjunction gives an important piece of information of a positive character, the hypothetical but recognizes the uncertainty of the judgment and one at least of the bases of the uncertainty.

The more general attitude toward an inference or a judgment that it is probable or possible, goes back to the same psychological con-

THE PSYCHOLOGY OF REASONING

ditions. When we are willing to assert that a result is probable but not certain, the conclusion when tested by experience is found to harmonize with everything that is explicitly present, but there is still a lurking feeling that it might not harmonize with some facts that are not so explicitly present. We have in this case no recognition of the attitudes that would lead to other conclusions, but there is still some remnant of the doubt consciousness that is a sign that there is not complete harmony with all experience. There is not quite complete belief. When a statement is asserted to be possible, the doubt feeling is stronger and approaches a reservation of judgment. Possibility and probability then are merely expressions of the doubt consciousness. The doubt feeling is present but there is no definite appreciation of the conditions that give rise to it, there is no recognition of the particular parts of consciousness with which it will and will not harmonize as in the hypothetical and disjunctive judgments.

The assertion of necessity or certainty would be on its face the expression of the perfect harmony with the entirety of experience. It is probable, however, that in practice the

DEGREES OF TRUTH

results that are asserted to be absolutely certain are really in greater doubt than those that are made and never questioned. As we have seen so frequently it is only when there is a preliminary doubt that a conclusion is ever questioned, and at most to assert that a conclusion is necessary means that the preliminary doubt has been dispelled upon examination. Even then man is prone to assert belief most positively when least certain, that there may be no sign in speech of the wavering in the speaker's own mind. Barring this evidence of human frailty which is rather a matter for psychology or for ethics than for logic, we might arrange the inferences and judgments in the order of their harmony with the experience of the individual, and in order of their truth for him in the series, (1) those that are unquestioned, (2) the necessary, (3) the probable, (4) the possible, and (5) the rejected. The hypothetical would fall under the head of the probable or possible in which the particular conditions of doubt or belief had become self-conscious, in which one had become aware of the particular phases of experience with which they were or were not in harmony. All phases of modality are an expression of the fact that every inter-

THE PSYCHOLOGY OF REASONING

pretation and every inference is tested by the background of knowledge, and that acceptance or rejection, partial acceptance or partial rejection depends upon the completeness of harmony with the accumulated experiences.

When after the knowledge of the individual has passed upon the conclusion and it is still found that there is a disjunction, when it is appreciated that in the present state of knowledge there are certain factors that make for one conclusion and certain factors that make for another, the problem is put to the test of experiment. Even then it is not at all unlikely that the results will fall out now in one way and again in another. This is the usual result in matters that are at all complicated. But the discussion takes us over to the probability of an inductive proof.

It remains but to insist that the probability of the judgment or of the conclusion is one of the results that may come from the process of bringing the conclusion to the bar of experience after the operation of interpreting or of inferring has been completed. When one turns to examine the product of the mental operation, it may be found to fit in under some law already accepted, it may be found that it not only has no

DEGREES OF TRUTH

resting place in the completed system, but that there are certain parts of knowledge with which it will not harmonize, while there are others that seem to demand it. In the one case, the conclusion is proved as in the syllogism; in the other we can do no more than assert doubt in varying degrees by the word probably or possibly or can perhaps show that the doubt rests upon a particular conflict, a conflict between two definitely formulable phases or aspects of knowledge. In either case truth or uncertainty depends not upon the particular process before the bar but upon its relation to the organized whole of knowledge.

When a conclusion is put to the test in experiment or by observation it frequently, in fact usually, happens that it will be confirmed by some trials and not by others. Then the question presents itself: is it possible that the statement is true nevertheless and, if it is possibly true, what is the degree of probability? That the conclusion may still be accepted in the face of certain negative instances is believed because a real connection between two events may be obscured in one of two ways: by errors of observation and by the action of irrelevant forces which can not be excluded or detected

THE PSYCHOLOGY OF REASONING

when present. The former will affect any observation whatever, but will be important only in disturbing measurements,— usually the presence or absence of a cause is not easily concealed. Irrelevant circumstances are likely to obscure the presence of the real cause. The former is less interesting for our purposes. Suffice it to say that the greater the similarity between different measurements the more accurate the result. The mathematical treatment and measurement of probability in this use would take us too far.

Where on the other hand one is seeking to determine whether a connection that is observed or that has been suggested is really causal there is more evidence of the nature of the thinking process and of the factors that give probability. The assumption upon which the calculus of probabilities depends is that in a mass of influences that are governed by no law one is as likely to occur as another, and similarly that when the causes are unknown one effect is as likely to make its appearance as any other. When a cause and a particular effect appear together more frequently than they should on this assumption it is believed that the connection is one of cause not of chance coincidence.

DEGREES OF TRUTH

The more frequent their joint appearance the greater is the probability that the connection is causal, not chance. We need not here go into the more detailed mathematical computations or even consider Mill's canons. It is rather our problem to show the similarities between probability in inductive and deductive proofs from more general considerations. For, while frequency of connection is the explicit ground for assuming that a connection is real, one may easily trace the influence of older experiences and of meanings. Usually one suspects a causal relation before the coincidences have been observed. Even when a causal relation is suggested by the coincidences a large part of the probability is derived from the agreement of the connection with large masses of experience. Unless the relation seems important or the cause appears to be really adequate to the effect on other grounds, even frequent coincidences will not suffice to make the relation seem to be one of cause and effect. For instance, I have frequently been struck with an uneven distribution of the initials of my students over the alphabet. One year there will be an undue proportion from first letters, the next the latter half of the alphabet will

THE PSYCHOLOGY OF REASONING

predominate. I have never worked out the relation, but were the calculation to confirm the conjecture, one would certainly not regard it as evidence of the working of obscure causes. Rather one would still insist that it was a peculiar chance, working even through a large number of instances. It is only when such a relation can be seen to have connections with other laws and other parts of the system, when it seems reasonable, that a number of coincidences will be accepted as proving a causal relation.

✓ Cause itself is on the same level as the meanings we have been discussing. It is a crystallization of numerous experiences into a general principle that now serves to give order to experience. It is easier to trace the course of precipitation of the causal principle from the original chaos than it was to understand the development of many other meanings. The center is apparently the feeling of human effort, the mass of feelings that appear when we are accomplishing something in the world as compared with the passivity that marks our attitude toward events that merely happen. This original personification has been much modified by the numerous instances of purely mechanical

DEGREES OF TRUTH

relation that have been classed with it. Even now, however, we sympathize with a cause that seems not quite adequate much as we would with a person. We find our muscles tense as we watch an automobile that is barely able to reach the top of a hill, or even when an induction current is not quite strong enough to induce a muscle to contract in a physiological experiment. Whatever may have been the origin of the relation, it has developed in the course of time to become a systematized relation on the same level as a meaning. As such it serves to give definiteness to the experiences that are referred to it. On the other hand the nature of the relation that is assigned to successive events is dependent upon the wider ramifications of the experience, not alone upon the frequency of the connection or the nature of the objects connected.

If one is observing particular relations the probability that a connection will be regarded as causal will depend then upon reference to the causal relation and upon the degree with which the assumption that it is causal harmonizes with related experiences. One might add that even the mathematical determinations of probability from coincidences

THE PSYCHOLOGY OF REASONING

is itself to be justified by certain assumptions that were established on general considerations, and have been justified only by the completeness with which they agree with observed facts. Gauss's formula for the distribution of observations was certainly not established by mere observation, and no more was the assumption that where conditions are unknown one effect is as likely to predominate as another. The working assumptions of all computations of probability is in terms of meanings, the relation that we call causal is a meaning, and each is dependent for its particular application not alone upon observations of the moment but upon the degree to which the observation may be interpreted by definitely formulated earlier experience, and by the degree to which the interpretation when applied will harmonize with related experiences.

✓ The probability that a causal relation will be ascribed to successive events will depend first, upon the number of coincidences and second, upon the degree to which the suggestion harmonizes with related experiences. Ordinarily the two work in harmony. If the number of coincidences is large one turns at once to discover some earlier accepted principle that may be connected with them. If that is not found

DEGREES OF TRUTH

one would suspect fraud, would assume some mysterious force, or would put the observation aside as mere chance result or as inexplicable. On the other hand, could one find no empirical evidence to support a relation that seemed probable on general grounds one would either distrust the observation, assume that the cause was too slight to be observed or assume that some mistake had been made in the conclusion.

✓ Neither inductive nor deductive proof will give any high degree of probability unless confirmed by the other. The probability assigned to any conclusion that may be given application will depend in part upon observed coincidences, in part upon its relation to other experiences.

CHAPTER X

CONCLUSION

One general principle that has been emphasized in connection with each separate problem may still require more explicit discussion. This is the statement of the nature and action of meanings or types, or the system of knowledge. It has been stated just now and, on occasion throughout, that the beginning as well as the end of all reasoning has been the establishment of a system of things and of explanations that corresponds on the empirical level to the world of universals of Bradley and Bosanquet. This is a statement that is manifestly dangerous as may well be seen from the abuse of the idea in many systems of philosophy. I desire by way of final statement to limit the principle of explanation that it shall not seem to mean either too little or too much. In the first place I desire to insist that it is intended that no mystery or miracle shall be concealed in the term, although there is very much ignorance about

CONCLUSION

many of the applications. If possible my aim in this final summary is to draw a line carefully that shall delimit both our ignorance and our knowledge of the principle that has been made so much of.

In the first place my intention has been to introduce into the system nothing that can not be discovered in the concrete consciousness, and to insist that the system has been developed in consciousness, or at least through experience. On the other hand it must be insisted that the system is not a mere accumulation of experiences and its elements are not particular experiences. If one asks on the common level of observation what is meant by this system, we must answer that it is the world of things as it is thought of in our every day life. On a somewhat higher level it is the world of the scientist, so far as it is represented in the mind of the individual. We may affirm in the light of our earlier discussion that our mental states are primarily the world as we think it and as we see it. There is no evidence of a world of discrete sensation apart from this unitary and interpreted world of things. We do not have as we think or perceive a mass of discrete sensations, or of other distinct elements. What we

THE PSYCHOLOGY OF REASONING

do have in mind on the contrary is an articulate system that comes at once and monopolizes consciousness from the moment that there is consciousness.

If we turn from vague general statement to the question of origin and development, it may be possible to make a little clearer the nature of the process, as well as its origin. That an atom or an idea of cause could anywhere be seen or otherwise make its appearance as a single event in perception is incredible. All attempts to explain the development of any of the real units or relations in that way have proved to be failures. One never sees an atom, one never sees an ether vibration, one has direct and immediate consciousness of none of the fundamentals of reality or of science. In an earlier discussion we saw that the simplest object did not make its entrance into consciousness as it is found to exist in consciousness. Even the desk in front of you has never given rise to a retinal image that is like your memory or your percept. We saw that the simple object had developed from experience by a process of trial and error that resulted in making a mental picture that was like no single impression that had ever fallen upon the retina. One chooses

CONCLUSION

from the images and from thought modifications of the images that which best fits into experience, which satisfies the largest number of practical tests. It is the one that will work under the more important conditions. It is, therefore, accepted as real.

Consideration of the development of any idea seems to afford evidence that it too has developed in very much the same way, at least by the same general laws. The development of the more general ideas of the science gives evidence of a similar principle on a large scale. Suggestion after suggestion is made and that one is accepted that best explains the knowledge of the period in the field in which it is offered. These suggestions are by no means independent of actual experience as to their nature, but it is equally certain that they are very often not directly given in experience. How they stand to the concrete experience is difficult to assert. It can be said only that the explanations are not indifferent to experience. The degree of similarity to particular experiences varies in different cases from near zero to approximate identity. The process of developing the explanations has been enormously slow. The process by which the system has crystallized out

THE PSYCHOLOGY OF REASONING

of discrete experiences has been long drawn out, but it has been gradually approximating its end. More important than the origin of the suggestion is the question of what makes the selection, of what it is that decides which one is fit and shall survive, which unfit and is to be rejected. This decision is, as was seen in the case of the syllogism, entirely in terms of the accumulated experience. Any suggestion that will harmonize with that experience and unify it will be accepted and each explanation will be rejected whenever new facts develop that can not be taken up into it. More truly perhaps it might be said that an old theory will be rejected when a new theory is suggested that is better suited to the facts, for occasionally a theory that is no longer adequate will persist by inertia until some better one appears. This, for example, is the present status of the physiological color theories, and I have no doubt other theories in many different sciences could be found to illustrate the fact. However theories may be suggested, then, they are tested by the degree to which they serve to harmonize the accumulated experiences.

What I have been arguing for is that the individual consciousness contains a system or

CONCLUSION

systems that are on exactly the same general plane as this system of knowledge as it is formulated in the sciences. This system springs up in the individual mind in a way that is fully as difficult to trace as the development of the scientific conception of the world. For the most part, the origin is apparently by the method of trial and error. The suggestions have their material furnished by the senses and experience in general, but are always modified from the contributions of sense. The test of the system again is that it harmonizes the experience of the individual, and that it will work when put to the test. That it is closely related to experience in origin and in the way it is tested is shown by the closeness of its relation to the amount and character of the experience of the individual. In the child, in the man of early historic times, in the savage and the ignorant of to-day, it will be poorly developed; in the man of science of the present it will be well developed along certain lines, no matter how poor its development in other relations. Wherever it is found, it will be adequate to the experience of the individual. When developed, it is what the individual calls his real world. This world or individual system of knowledge

THE PSYCHOLOGY OF REASONING

includes not merely concrete things and single relations but also typical forms of relation that are recognized as the more permanent causes and the innumerable general principles and laws. The substantive resting places in the entire connected system constitute our types, meanings or concepts and are the things of the popular mind; the ordered relations are space and time on the more passive side, cause and effect, reciprocity etc., as more active relations.

When we ask how this system is thought, one must be careful not to be misled by the details of structure. The system is the essence of the consciousness of every individual, but it can not be easily described in terms of discrete elements. To understand how it is conscious, one must pay more attention to the relations and connections than to the elements. While the system in its entirety can not be conscious at once, it is always present as a background of consciousness, and all experience is in terms of some part of it. The system is effective more as a possibility of reinstatement than in what is actually presented. When one part is presented there is felt the possibility of the reinstatement of all that remains. This felt

CONCLUSION

potentiality of reinstatement constitutes the awareness of the system or of the part that is open to return at the time. It is as when one cites a familiar proposition in geometry, or in the construction of a piece of apparatus comes to a part that has been used frequently before. As soon as the proposition is cited, it is accepted as established, and thought goes on to something else with perfect confidence. The accepted potentiality of recall has all the efficacy for proof and for use that detailed recall would have. Any consciousness of the system seems to be nothing more than this accepted capacity for reinstatement. In fact, any bit of experience is nothing more than the consciousness that accompanies the point of intersection of open paths of association. Consciousness is not of the element itself but always of the element plus many of its connections,—how many depends upon circumstances. Consciousness is of the whole with emphasis upon the part, never of the part alone. Granted the awareness of the open paths of connection, it seems to make very little difference what the actual imagery may be. Some think in terms of vision and see things with perceptual-like fidelity, others have but vague imagery or use some other sense for

THE PSYCHOLOGY OF REASONING

the recall of objects, while still others seem to have practically no imagery of any kind. Yet all think the same thing and with indistinguishable degrees of effectiveness. This indifference of the image seems to find its explanation in the fact that what each man thinks has the same group connections. With the same connections the same end is attained, no matter what the kernel may be about which they center and from which they irradiate. The consciousness of the system seems to depend very largely upon the connections that are established between part and part, connections that are reflected in consciousness over wide areas even if the particular mental state seems to be of limited extent.

Granted the existence of this system of knowledge, all thinking is in terms of it. Thinking grows out of it on the one hand and on the other serves still farther to develop it. At any given moment it is the starting point of thinking and controls thought, and at the same time each end attained by thought serves to develop and enlarge the system. Each of the reasoning processes illustrates one phase or the other of this operation of elaborating experience in terms of the sys-

CONCLUSION

tem, or of elaborating the system in terms of experience. Judgment we have seen to be definable as the process of taking the presented something up into the system. Thereby the presented is interpreted and prepared for understanding. In the process of inference, the situation that has been interpreted is modified in thought or in practice better to satisfy the needs of the moment. To put the matter more concretely, judgment may be said to consist in the appreciation of a difficulty; inference, in the process of removing the difficulty. Before judgment there is only vague bafflement; with judgment the source of the difficulty is appreciated, and this recognition prepares for the remedy that is sought and found in the inference. When it has been found, it will ordinarily in some degree modify the system.

The system also serves in various ways to control the operation of interpreting and improving. Even for the needs that impel to interpret and to improve we must look beyond the momentary consciousness. The need is ordinarily not to remove an instinctively disagreeable effect. The need arises from the wider purpose of the individual, and this purpose is itself something that arises because of a

THE PSYCHOLOGY OF REASONING

felt gap in an ideal system. One has ideals, and ideals are not realized in the immediately presented. The disparities between the ideals and the appreciated situation creates a need, just as the realization of an ideal creates a purpose that will extend over a longer or shorter time. During the dominance of the purpose, interpretations and inferences are devoted to the attainment of the end, be the end actual or only the solution of a problem in thought. On the one side the mental life might be regarded as the appearance, one after the other, of different members of the hierarchy of purposes. On the other hand the appreciated situation is constantly calling into being new factors that serve to develop and to check purposes. From this point of view, the movement of thought might be regarded as an interaction of purposes and environment, each of which in some measure modifies the other. At least no interpretation and no improvement can be considered as a discrete event. It has its meaning in, and its appearance and development is controlled by, wider mental and physical contexts. These serve to determine the nature of the appreciation and to give the desire that leads to the particular improvements. In this way the

CONCLUSION

progress of thought is one continuous operation. No part can be understood unless it is considered with the whole. The occasion for the interpretation is found in the purpose that is controlling consciousness at the time; the way the interpreted or appreciated presentation is improved depends upon the universe of thought in which the separate process arises. The system of purposes is as definitely organized as the system of knowledge. It is the outcome of the same experience that gave rise to the system of knowledge. Other factors are emphasized in it that are not so definitely emphasized in the development of the system of knowledge, such for example as the instincts, and the impulses to avoid instinctively disagreeable situations. The large mass of experience, however, would be identical in each; the organization alone is different. Of both the system of knowledge and the system of purposes we may say that they can be understood only as wholes and that any attempt to consider a fragment of either must inevitably lead to failure, to an inadequate explanation even of that part.

Very much the same remarks may be passed upon the tests of truth as upon the materials of which reasoning makes use, and the incen-

THE PSYCHOLOGY OF REASONING

tives to progress. As has been said repeatedly, what may be accepted as true depends upon the same organized mass of experiences, but it is active here as a magistrate in passing upon the interpretations and the conclusions that suggest themselves. Harmony with the mass gives belief, conflict gives doubt or immediate rejection. As in science and in the development of meanings in the individual, the suggestion is consciously tested only after it has been formed. Ordinarily the suggestion is adequate, and no consciousness need attach, at least no question of truth arises. Action goes on with no further consideration, or thought progresses to the next undertaking. Where there is conflict the testing may become self-conscious. Then we have explicit justification by reference to an earlier accepted general principle. If it fits under the head, we have the belief spreading from the already accepted to the new suggestion. This process of explicit justification is the work of the syllogism in formal logic. If the reference to the general is not satisfactory, we may have doubt in varying degrees that finds its expression in the modal judgments. In any case whether the justification is explicit and formal or whether it be implicit and informal, the ulti-

CONCLUSION

mate test of truth is the harmony of the suggestion with the organized and unorganized knowledge so far accumulated.

Our system then we have made to perform three distinct functions in the reasoning operations. First we say that the systematized purposes provide the incentives to all reasoning, to all advance in knowledge; they also determine what the general course of the advancing knowledge shall be. In the second place the developed system of knowledge with its elements, the meanings and concepts, provides the materials out of which the interpretations originate, and from which improvements of the interpreted situation may be drawn. In the third place the same mass of knowledge passes upon and selects or rejects the interpretations and conclusions that are derived from the system of knowledge to satisfy the system of needs. The three functions are more distinct than the systems that perform the functions, but the functions themselves all work together to the single end of the advancement of knowledge.

An important side of the reasoning process is the expression of the results in language, and their acceptance and comprehension by another. This is at once the basis of further advance

THE PSYCHOLOGY OF REASONING

in the knowledge of the race and is important to the individual in giving him a wider test of his results. Upon the two depend the more important advances in the knowledge of the individual and of the race. It is this phase of the reasoning process that most concerns the formal logician. Formal logic would probably be most accurately defined as the science of the interpretation and proof of the detached propositions. In comparing the expression of a thought with the thinking itself it is necessary to consider a set of controls that is not present or active in the thought process of the isolated individual. This is that his expression always takes into account the knowledge and present purpose of the listener. To adapt one's expression to that becomes one of the guiding purposes of the speaker and thinker. As the position and the knowledge that is assumed to be possessed by the listener changes from moment to moment, a change in linguistic expression may mean a change in the speaker's thought or it may mean that the hearer has changed his position, or that the hearer has changed and that the new listener is assumed to have different knowledge and different purposes or interests from the last. To under-

CONCLUSION

stand any spoken statement, it is necessary not merely to consider the words as they stand, but the mental setting of both speaker and hearer, the mental setting of the hearer at least as it is presupposed by the speaker. We have seen that many of the distinctions of the formal logician are misleading, both because he considers the proposition without reference to its context in either mind, and because he neglects to consider the social factors that control speech but do not control thought. As a consequence his discussion of the proposition is ordinarily based upon what it might mean under any conceivable conditions, while in actual use it means at once less and more, because it can be understood only in its context, only as a part of the universe of discourse. Logic, then, may be said to be different from the psychology of reasoning because it is primarily concerned with thought as expressed in language rather than with thought itself. In inference it is concerned with providing proof for a conclusion after it has been given in language; it has not been concerned with the origin of the conclusion. The psychology of reasoning is or should be concerned with the progress of thought as a whole and of the particular bit

THE PSYCHOLOGY OF REASONING

of reasoning in its setting. It is also concerned at once with the genesis of the interpretation or the derivation of the conclusion and interpretation, and with its truth, so far at least as the test of truth is a concrete psychological state with assignable conditions.

Our final picture of the reasoning operation in the individual is of the development of a system of knowledge, that is constantly progressing from original chaos toward perfect order. Only in so far as there is system is there consciousness, but the system with its consciousness is developed from an original unsystematized experience. Every new impression is interpreted by being assigned a place in the system, but each new impression also tends as well to modify the system. The result is that out of the system everything comes, into the system everything goes, and still as the net result of the operation there is progress. In every man there are, of course, conflicting partial systems as James has shown so brilliantly in his *Psychology*. But the progress of thought tends to an amalgamation of systems as it tends to a development of the systems. First there is partial crystallization of knowledge about different centers; as more

CONCLUSION

experiences accumulate several systems may be thrown into one, they may be organized about a single center. The last generation has seen such an amalgamation between the systems of physics and of chemistry. The growth of the system of any individual shows many such amalgamations on a smaller scale. Perfect knowledge, if one were to indulge in utopian speculation, would probably involve a perfect unity of all parts of knowledge, but that we may imagine to be far away. At that time there would be no conflict, no doubt, no incentive to progress; Nirvana would be attained.

Two factors in the process of development have been but lightly touched upon. These are the interaction of individual upon individual, and the test of the accumulated experience in action when once it has been obtained. Both have been taken for granted as one of the sources of knowledge that were constantly providing material to the various systems. The social life is perhaps more largely effective in providing incentives, in offering material for the system of purposes; the active life adds more in the way of tests of adequacy, but each necessarily modifies the system of knowledge as a mass of materials.

THE PSYCHOLOGY OF REASONING

Granted that knowledge is this consistent system that is constantly developing by taking new materials up into itself, there are a number of more general problems that suggest themselves. For example, what is the relation of the system to what is ordinarily called the human mind and to the real material world without? If it is progressing, where is it going? Whither is it tending? Each of these questions takes us well beyond the confines of either logic or psychology, but it may be well to make a few dogmatic statements concerning them to show that the problems are recognized and to state some of the connections of our results with the more generally recognized problems of epistemology. To the question of the connection with the external world we may say that our system is the external world as it is appreciated. Whether there is an external world that is not appreciated seems to me to be a question that by the very manner of its asking can not be answered. At the most it is but the limit toward which the system must be pictured as progressing. When more is systematized it will be part of the system of knowledge, before that we can never know whether it exists or does not exist. The outside world will always

CONCLUSION

be thought of as the source from which knowledge comes just because there is growth in knowledge. But all that we know is the fact that there has been progress in the individual and in the race, in the knowledge of the individual and in science as a whole. While we are bound to think of the material world as the goal toward which all knowledge is tending, we know it only in so far as the goal is attained, and the material is appreciated as part of our system.

Very much the same remarks must be made of an absolute idealism that would find the goal of knowledge in some world of universals, or of ideas in the sense of the neo-Hegelians or of Plato. This, too, can be only a *terminus ad quem*, it is a concept that explains the fact of progress. Its justification is the same as the justification of the external world. It has no better standing and no worse. It saves the system as we know it from being suspended in air and from being independent, but it is at best only one way of organizing the fact of progress in a larger system. It, too, either is unknown or when known ceases by that very fact to be a permanent ideal outside the system. Both the external world thought of as independent of

THE PSYCHOLOGY OF REASONING

being experienced and the world of ideals or universals regarded as the permanent verities that are gradually being revealed in the course of experience, individual and racial, can be justified only in so far as they serve to unify experience. As they unify experience, they become part of the system, and in so far no longer permanent entities outside.

If we ask the more definite question of the relation of the system to the concrete human mind as it is usually treated psychologically, we can find our answer in the statement that the mind is just another system of ideas that has been gradually developed about a center slightly different from that about which the system of the external world has crystallized. When an attempt was made to understand how the individual might know, the answer was given in terms of the system of psychology. This system has not been altogether unified with the system of the external sciences as is evidenced for example by the difficulty in explaining the relation of mind to body. Psychology is an attempt to explain the facts of experience by bringing them into an independent system. In the one system an event is a thing, in the other system the same event is a sensation, a percep-

CONCLUSION

tion or memory. The difference is in the way the single event is classified. A perfectly unitary system would and we hope will unite and harmonize the two explanations, but for the present they can only be thus referred to two systems and the two must be permitted to remain side by side.

Our system then is at once the actual experience of the individual, and it is the actual reality of the external world so far as it has been revealed. It partakes of the nature of the world of the realist in so far as it is a stubborn fact that can not be changed by mere willing, or by any other arbitrary act of the individual. It partakes of the nature of the mind of the idealist since it is always dependent for its existence on the interpretation and appreciation of the individual. Some of the more naïve minds seem to think that if a thing is made a mental state, that it ceases to follow law. One healing cult for example disposes of disease as an error of mortal mind and assumes that it is cured. While granted the original premise, it might quite well follow that other mental operation like the taking of thought pellets and the removing of imagined gangrene from an imaginary member may result in an imaginary cure, while the

THE PSYCHOLOGY OF REASONING

error, if permitted to persist, may necessarily extend in thought until the imaginary member together with the imagined body is dissipated into imaginary space. To call a thing an idea does not make it open to change at will. Thought laws may be as certain and inflexible as the laws of crass matter. On the other hand it is occasionally assumed by the popular mind that when a thing is called external it is external just as it is thought. Needless to say the results of the sciences make this view quite as untenable. Colors, for example, have given place to vibrations, and these to electro-magnetic phenomena in a way that shows that the nature of the external object in the nearest approach that we can make to it is colored by the mind that thinks it. A thing is an external object when it is taken up into the system of the sciences; it is a mass of sensations, an idea, when taken up into the psychological system. What it is out of a system we can not say. Whether we call the thing appreciated real or ideal seems to me a matter of indifference. The experience is the same whatever we call it. As long as the ground I walk upon sustains me and the food I eat nourishes me it makes no difference whether I call it material or call it mental.

CONCLUSION

The name does the experience neither good nor ill.

The elements of the system of knowledge are real as the things of the sciences and the things of common sense are real. They can always be relied upon, are in no sense arbitrary. They are ideal as the ideas of Kant and Berkeley are ideal, because dependent for their nature upon being perceived, upon being taken up into the whole of knowledge. It is neither external nor supra-mental in the literal sense of the terms. Whether either the supra-mental or material realm exists as it is pictured seems to me a matter of indifference, for if they did exist they could not be known. At the same time there must ever be a partially organized mass of experiences that will furnish material for systematization. This mass of unorganized material will always be partly organized before it is organized completely. To explain this partly organized mass we are bound to have ever with us the hypothesis of an external world or of a fixed and eternal world of ideas. Even this partial formulation exists, so far as it exists at all, only as part of the one unitary system of knowledge.



INDEX

A

Absolute time as type, 75.
 Abstract reasoning, 5.
 Abstract qualities, 60.
 Action, Inference as, 193f.
 relation of, to reasoning,
 2, 5f.
 test of belief, 25ff, 55.
 Analogy, 226-231.
 and syllogism, 227.
 Animal reasoning, 1.
 Apperception, 12.
 Appreciation of situation
 the beginning of rea-
 soning, 9.
 Appreciation of space rela-
 tions, judgment not
 inference, 116-120.
 Aristotle, 216.
 Art, belief in, 48ff.
 Art and play, 50f.
 Association, basis of infer-
 ence, 191f.
 Attention as appreciation,
 12.
 Attitude, 12.

B

Bain, 25, 28, 31, 55.
 Baldwin, 135.
 Belief, 23-59.
 a social product, 56.
 a test of truth, 23.
 as harmony with experi-
 ence as a whole, 40f,
 52f, 287f.
 as mark of reasoning, 4.
 Conscious quality of, 57ff.
 dependent upon clear and
 distinct ideas, 24.
 established by proof, 13.
 Growth of, 43ff.
 History of, 23-30.
 in dreams, 45ff.
 not arbitrary, 53f.
 primary; doubt second-
 ary, 25ff.
 unanalysable, 27.
 Bentley, I. M., 78.
 Berkeley, 299.
 Binet, 184.
 Bosanquet, 18, 62f, 64, 71,
 77, 108, 110, 170,
 184, 276.

INDEX

Bradley, 18f, 36, 62ff, 64,
71, 77, 105, 108,
117f, 112, 147, 158,
170, 184, 276.
Brentano, 27f, 31f, 57, 102,
111f, 135, 146, 152,
184.
Brown, Thomas, 185.

C

Cause, as recognition of
type of connection,
273ff.
dependent on coincidences,
271f.
Comparison, a single opera-
tion, 113-116.
ascription of, typical dif-
ference, 113.
character of, dependent
on purpose, 114.
Concept, 60-98.
as type, 71ff.
and general law com-
pared, 218.
Genesis of, 65.
Physiology of, 69ff.
Structure of, 92ff.
the sum of attributes,
94ff.
Concept-feeling dependent
upon association, 67.
Conception, 15.

Conclusion, product of as-
sociation, 188f, 191ff.
Consciousness, exclusively
of types, 85-89, 108ff.
Consistency, basis of belief,
29.
Copula, Theories of, 139-
149.
"Cortical set," 12.

D

Darwin, 195f, 237f.
Deduction and induction
compared, 246f.
Dewey, 158, 184.
Disjunctive propositions,
261-265.
Disbelief, always belief in
something, 35f.
Doubt, 25.
a positive process, 31ff.
due to fluctuation of in-
terpretation, 34f, 42.
in matters of theory, 37.
preliminary to all proof,
267f.

E

Einstellung, 75.
Euler, 142f.
Evaluation, outcome of cog-
nition, 123ff.

INDEX

dependent upon experience, 125-129.
 Mechanism of, 133f.
 Experiment, originates in doubt of suggestion, 197.
 presupposes general principles, 242-245.

G

General conclusions as typical, 200-205.
 General idea, 71f.
 Genius and insanity, 198.
 Given, The, not conscious until appreciated, 107.

H

Habit, Relation of, to reasoning, 2, 5, 6.
 Hayden, 74.
 Hegelians, 214.
 Helmholtz, 184.
 Hume, 24, 220.
 Husserl, 18f.
 Hypothetical propositions, 257-261.

I

Idealism, 295f.
 Image and idea, 62f.

Imagery of types, 83ff.
 Imagination distinguished from reasoning, 2ff.
 Inconceivability of opposite, 220.
 Induction, always presupposes general principles, 240ff.
 and deduction compared, 246f.
 as a process of inference, 247-254.
 never complete, 238.
 Inductive proof, 236-244.
 Inference, 15, 172-199.
 as action, 193f.
 distinguished from judgment, 184.
 distinguished from proof, 187-190.
 related to synthetic judgment, 178-183.

Instinct, opposed to reasoning, 2, 5, 6.

J

James, 28f, 54, 207.
 Judgment, 99-136.
 Analytic and synthetic, compared, 173-178.
 and language, 137-171.
 as appreciation of situation, 15f.

INDEX

Judgment, as analysis and
synthesis, 147ff.

as ascription of meaning,
102f, 104-110.

as ascription of two
meanings, 161-166.

as assertion of existence,
146.

as belief, 102ff.

as classification, 144f.

as comparison, 101f, 113.

as equation, 140ff.

as evaluation, 121-134.

as recognition, 146f.

as reference to types,
106-112.

as subsumption, 142-146.

considered by formal logic
out of its setting, 138.

Definition of, 99f.

demonstrative, 154-157.

Formal logic theories of,
irreconcilable, 149.

Forms of, compared,
134ff.

Impersonal, 152f.

Interjectional, 151.

of formal logic, 137-150.

of perception, 151-171.

Simple categorical, 157-
171.

Terms of, reversible,
163ff.

K

Kant, 184.

Knowledge, a consistent
system, 276.

Development of system
of, 278-282.

System of, coextensive
with consciousness,
284f.

Kölpe, 184.

L

Language, Thought and,
289-292.

Lehmann, 73, 132.

Leibniz, 23.

Leuba, 78.

Logic and psychology, 14,
19ff.

M

Malthus, 195.

Marbe, 184.

Marty, 152.

Meaning, as movement, 91f.

Meaning and concept, 60-
98.

Definition of, 94.

Memory in relation to rea-
soning, 2ff.

Michelson, 242.

INDEX

Mill, 18f, 62f, 77, 105, 108,
271.

Mind and body, Relation
of, 296f.

Modality, 255-269.

Morley, 242.

Müller, 75.

N

Natural selection, Hypothe-
sis of, as illustration
of inference, 194ff.

Necessity, 266.

Neo-Hegelian, 71, 77, 84,
87, 102, 111, 295.

Newton, 266.

P

Particulars in induction al-
ways types, 238f.

Pascal, 23, 220.

Perception and apprecia-
tion, 13.

Plato, 23, 216, 295.

Platonists, 214.

Play and art, 50f.

Predicate as meaning, 160.

Premises, 185ff, 210ff.

Premise, Major, effect of,
to arouse belief, 211-
215.

Premises never complete,
222f.

Principle of sufficient rea-
son, 23.

Probability and possibility,
265f.

Measurements of, 269f.

Problems of reasoning, 17.

Proof, Deductive, as means
of arousing belief,
205f.

the last stage of reason-
ing, 10f.

Psychology and logic, 14,
19ff.

Psycho-physical parallelism,
38.

Purpose, controls the course
of reasoning, 9.

gives order to the terms
in proposition, 166f.

limits meaning of the con-
cept, 69.

Purposes, system of, 285ff.

R

Realism, 294f.

Reasoning, an operation of
the concrete con-
sciousness, 18ff.

Recognition, lacking in rea-
soning, 4.

Relations as types, 81ff.

INDEX

S

- Schumann, 74f.
- Sensation as type, 88f.
- Sigwart, 97, 146f, 164.
- Social control of expression,
153.
- Stages of reasoning, 9.
- Standards of value, 129-
133.
- Störring, 119.
- Subject as the given, 158-
161.
- Sufficient reason, principle
of, 219.
- Suggestion as solution of
problem, 10.
- Syllogism, 185ff, 200-226,
206.
and analogy, 227-231.
statement of proof, is not
inference, 206ff.

T

- Thorndike, 190, 232.
- Trial and error, a method of
inference, 188ff.
- Types developed by, 80f.

- Types, Development of, 73-
80.
involved in induction and
deduction both, 251-
254.
- Particulars in induction
usually, 238f.
- representative of particu-
lars, 89ff.
- the only content of con-
sciousness, 216f.

U

- Universals, World of, 63.

V

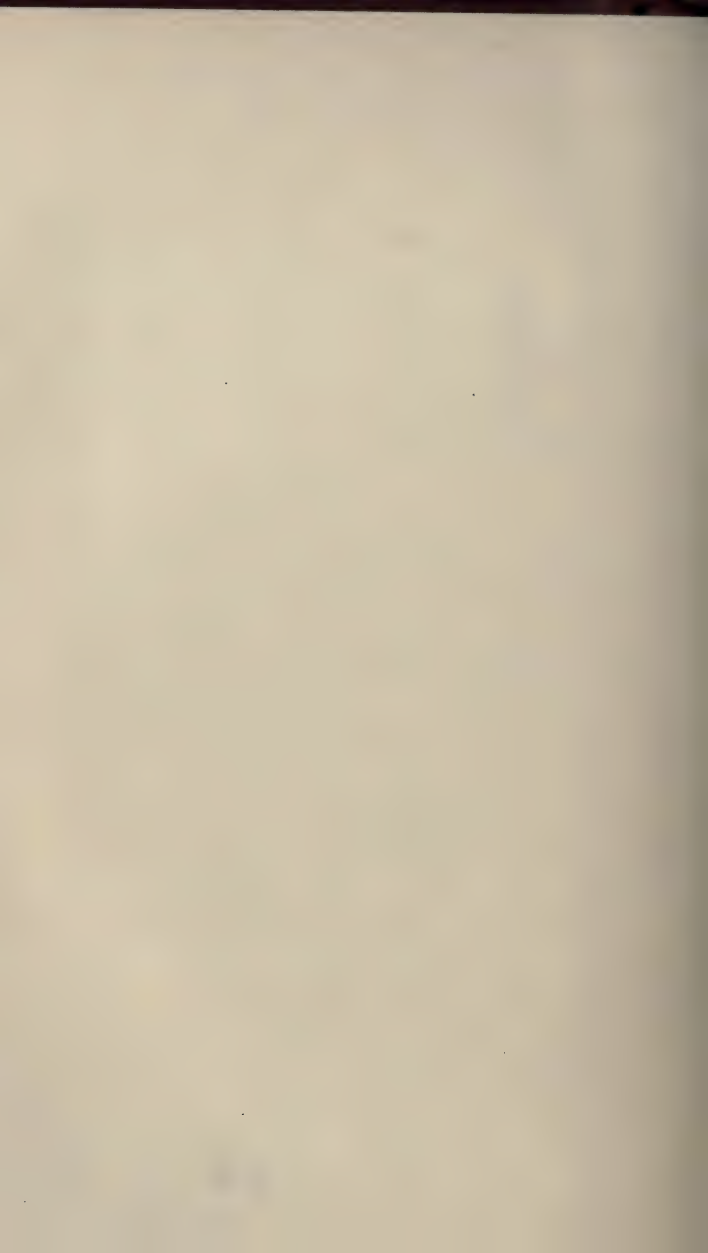
- Values dependent upon in-
stincts, 129f.

W

- Wallace, 195.
- Woodworth, 93, 115.
- Wundt, 57, 64, 147.

X

- Xilliez, 78.



A NEW VIEW OF DEATH.

The Individual.

A Study of Life and Death. By Prof. N. S. SHALER, of Harvard University. 12mo. Cloth, \$1.50.

Professor Shaler's book is one of deep and permanent interest. In his preface he writes as follows : " In the following chapters I propose to approach the question of death from the point of view of its natural history, noting, in the first place, how the higher organic individuals are related to those of the lower inorganic realm of the universe. Then, taking up the organic series, I shall trace the progressive steps in the perfection of death by a determination as to the length of the individual life and its division into its several stages from the time when the body of the individual is separated from the general body of the ancestral life to that when it returns to the common store of the earth. . . . In effect this book is a plea for an education as regards the place of the individual life in the whole of Nature which shall be consistent with what we know of the universe. It is a plea for an understanding of the relations of the person with the realm which is, in the fullest sense, his own ; with his fellow-beings of all degrees which are his kinsmen ; with the past and the future of which he is an integral part. It is a protest against the idea, bred of many natural misconceptions, that a human being is something apart from its fellows ; that it is born into the world and dies out of it into the loneliness of a supernatural realm. It is this sense of isolation which, more than all else, is the curse of life and the sting of death."

"Typical of what we call the new religious literature which is to mark the twentieth century. It is pre-eminently serious, tender, and in the truest sense Christian."—*Springfield Republican*.

"In these profoundly thoughtful pages the organic history of the individual man is so presented as to give him a vision of himself undreamed of in a less scientific age. . . . Speaking as a naturalist from study of the facts of Nature, Professor Shaler says that these can not be explained 'except on the supposition that a mighty kinsman of man is at work behind it all.'"—*The Outlook*.

D. APPLETON AND COMPANY, NEW YORK.

STUDIES IN PSYCHOLOGY.

Genetic Psychology for Teachers.

A New Volume in The International Education Series.
By CHARLES HUBBARD JUDD, Ph.D., Instructor in Psychology in Yale University. 12mo. Cloth, \$1.20 net.

This book deals with the facts and the principles of mental development. It takes up the special phase of psychology which is most important to teachers, for it traces the changes that are produced in mental life as a result of education in its various forms.

"One almost regrets the word 'Psychology,' " says *Primary Education*, "in the title of this book, lest it might drive away some teachers who might suppose it to be like other psychologies. It is not. It is a book of life. It is a scientific study of mental development prepared on the teacher's plane, and full of just what teachers should know and what they would like to know. The book should not only be in every school, but would repay analytical study by principal and teachers in weekly teachers' meetings."

Dr. J. J. Burns, Secretary of the Ohio Teachers' Reading Circle, has to say: "I think Judd's 'Genetic Psychology' a very profitable book for students of human nature; therefore, excellent for teachers and for reading circles."

While Miss Margaret W. Sutherland, of the Columbus Teachers' Reading Circle, states that "we have been using Judd's 'Genetic Psychology' in the Columbus branch of the Ohio Teachers' Reading Circle and have derived much pleasure and profit from it."

The Story of the Mind.

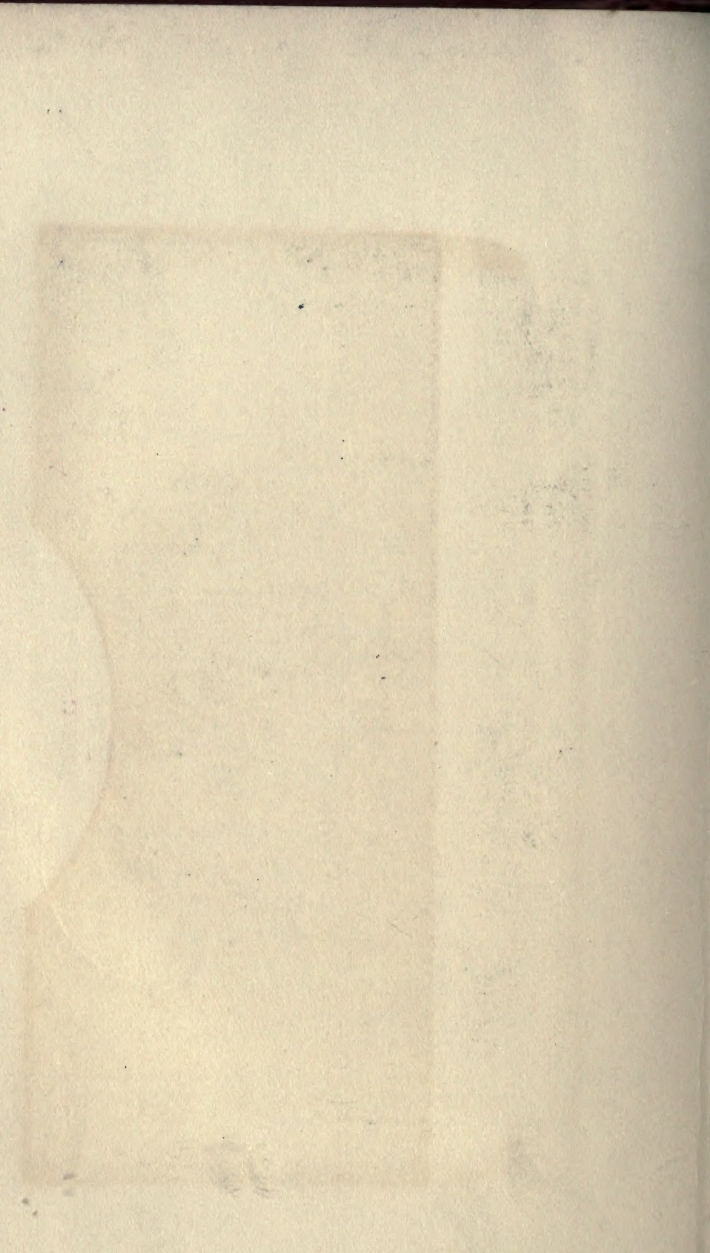
A Volume in The Library of Useful Stories. By Prof. J. MARK BALDWIN. Illustrated. 16mo. Cloth, 35 cents net; postage, 4 cents additional.

"A little book, easy to hold, pleasant to read, warranted to get read, without skipings, to its last word."—*The Nation*.

"A healthy interest will be stimulated in psychology on the part of those who will carefully read the little volume."

—*The New York Times*.

D. APPLETON AND COMPANY, NEW YORK.



UNIVERSITY OF TORONTO
LIBRARY

Do not
remove
the card
from this
Pocket.

Acme Library Card Pocket

Under Pat. "Ref. Index File."

Made by LIBRARY BUREAU, Boston

